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No. <u>13236</u>

ELECTRIC DRIVE STUDY
VOLUME 2 OF 2

CONTRACT NUMBER DAAE07-84-C-R017

DEC 1987

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By

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## APPENDIX A

TECHNOLOGY SURVEY SUMMARY

Appendix A Technology Survey Summary

## A.1 Technology Report

As required by contract DAAE07-84-C-R017, a comprehensive technology survey report was prepared between February and August 1984. This report details the approach and results of a survey of motors, solid-state controls, alternator/generators, and servo components which were potential candidates for the advanced electric drive study. In addition, solid-state components and various materials such as advanced magnetics were included in the survey. The survey report was approved in January 1985.

## A.2 Survey Update

The motor tree at Figure A.2-1 formed the basis for the motor Results of the survey effort for motor selection is shown in Figure A.2-2. This selection process was the result of an extensive matrix/tradeoff analysis and was initially used in early concept development. As the concepts were refined, performance vehicle factors became an influence in the motor component selection. The result of the influence was the selection of the Homopolar motor for the DC system and the high frequency induction motor for the AC system. The selection of these motors for the Configuration I analysis dictated the additional system components such as the conditioners/controllers and the alternator/generators.

Figure A.2-3 compares the selected motors with respect to operational and characteristic attributes. The hybrid permanent magnet (PM) "brushless" motor is included in the comparison to indicate the effect of relative complexity introduced by the total PM motor/power conditioner system. In this comparison, the DC and AC motors operate independent of an external power conditioner.

It is apparent for this update comparison that no clear "best" motor component selection is possible since each different type has certain advantages not shared by the other.

Motor power controllers/conditioners are compared in Figure A.2-4. In this comparison, the DC system appears to have some advantage due to the inherent gain of the DC motor and thus the lack of any power semiconductors. The power controllers/conditioners for the AC and hybrid motors are all DC to AC inverter systems and are designed around large power semiconductors.

A comparison of selected alternator and generator technologies is shown in figure A.2-5. In this comparison, the AC alternator candidate is a standard aircraft design with an operating frequency of  $400~\mathrm{Hz}$ .

The present status of candidate power semiconductors is shown in Figure A.2-6. As expected, the semiconductor industry continues

to work on improvements to increase the voltage and current capability and reduce the turn-on/turn-off time. No significant technology break-through's are presently foreseen in this area which would produce a radical improvement for use in high power drive systems.

It is unfortunate that the majority of high power semiconductor research is being done outside the United States.

Figure A.2-7 documents the trend in magnetic materials used in permanent magnet motors. With the introduction of Neodymium/Iron/Boron, an alternative is not available to replace, Smarium-Cobalt magnets for high energy density applications. Neodymium/Iron/Boron will continue to be improved and should be seen in products within the next 3 to 5 years. The use of this new material should yield a significant weight reduction and associated cost reduction in motors and generators.

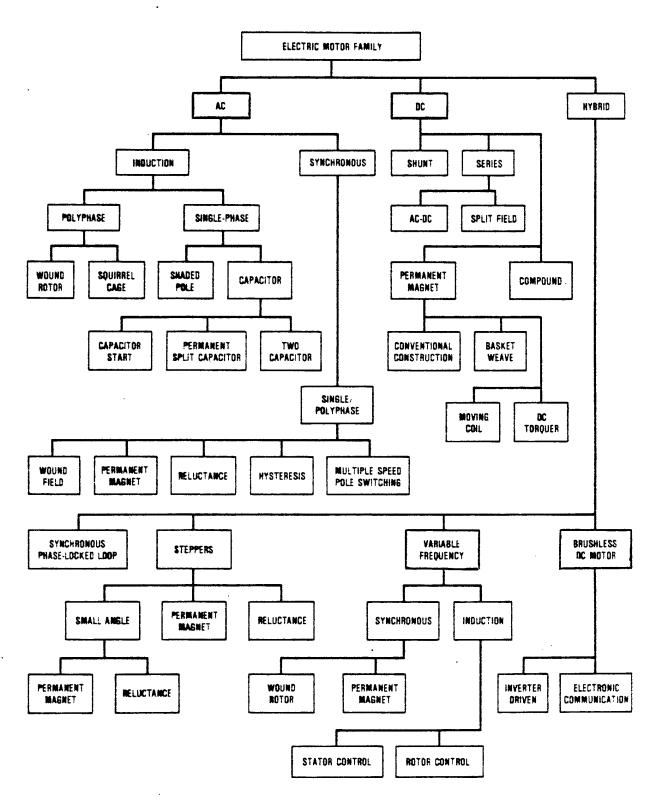


Figure A.2-1 Electric Motor Technology Tree

# Motor Technology Screen

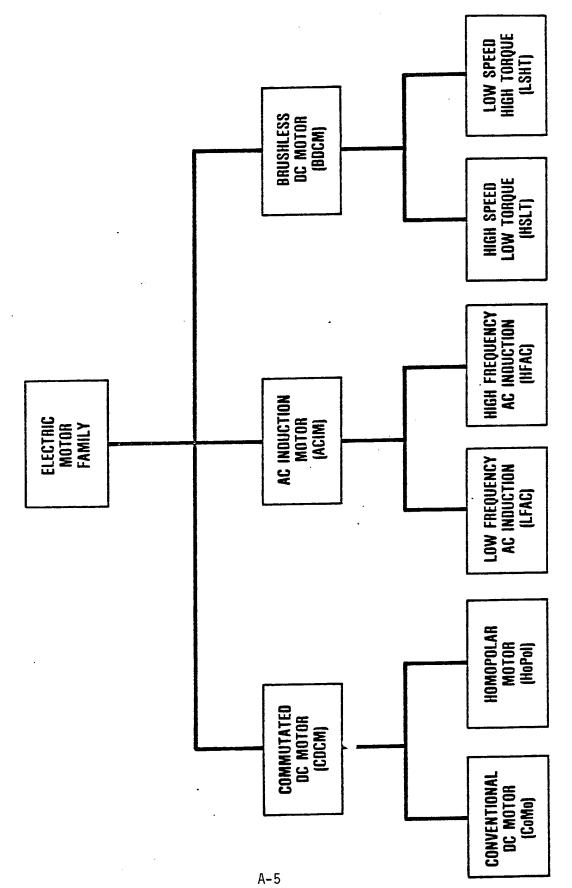


Figure A.2-2 Initial Motor Candidates

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- MOTORS -

ATTRIBUTES	DC (HOMOPOLAR)	AC (INDUCTION)	HYBRID (PERM, MAG.)
PEAK EFFICIENCY	92,8%	. 226	95%
SYSTEM VOLTAGE	18-32	200-600	009-00h
MAJOR LOSSES	BRUSH 1 <sup>2</sup> R	ROTOR 12R	STATOR 12R
OVERLOAD RANGE	14,37/1	14/1	6,4/1
PEAK TORQUE	>1000 LB FT	> 1000 LB FT	MAGNET LIMIT
SPEED RANGE	0-15,000	0-15,000	0-15,000
-P ROTOR INERTIA	TOM	MODERATE	MODERATE
PACKAGING	0009	0009	0009
THERMAL CONTROL	FL00D C00L	FL00D C00L	FLOOD COOL
SHOCK/VIBRATION	0009	0009	MODERATE
RELIABILITY	0009	EXCELLENT	MODERATE
TECHNICAL RISK	MODERATE	MOT	H1GH
RELATIVE COST	1.0	1.0	2,0

Figure A.2-3 Selected Motor Candidates

## 45MIG

ELECTRICAL SYSTEM COMPONENTS

- MOTOR CONTROLLERS -

ATTRIBUTES	DC (HOMOPOLAR)	AC (INDUCTION)	HYBRID (PERM, MAG.)
EFFICIENCY	> 95%	<b>26</b> <	<b>&gt;</b> 95%
CONTROL MODE	VF-PWM	VFAC	VF-PWM
CONTROL RANGE	100%	100%	286
CONTROL POWER RATIO	2,7%	100%	100%
COMPLEXITY	FOW	MODERATE	H16H
RELIABILITY	0009	MODERATE	MODERATE
POWER SEMICONDUCTORS	NONE	6/3 PHASE	6/3 PHASE
SEMICONDUCTOR LOSSES	MO7	MODERATE	MODERATE
REGENERATIVE	YES	YES	YES
EM1/RF1	TOM	MODERATE	HIGH

Figure A.2-4 Selected Motor Controllers

## ELECTRICAL SYSTEM COMPONENTS

## - ALTERNATORS/GENERATORS -

CHARACTERISTICS	AC ALTERNATOR (400HZ)	DC GENERATOR (HOPOL)
EFFICIENCY	HIGH - >93%	#16H - >93#
OPERATING SPEED	8000-12000 RPM	10000-14000 RPM
VOLTAGE CONVERSION	RECTIFIER	DIRECT
FIELD CONTROL	YES	YES
REGULATION	0009	0009
THERMAL CONTROL	SPRAY 01L	FL00D C00L .
REGENERATION	INVERTER/RECTIFIER	BI-DIRECTIONAL
POWER/WEIGHT RATIO	EXCELLENT	0009
POWER/VOLUME RATIO	0005	0009

## ELECTRICAL SYSTEM COMPONENTS

SEMICONDUCTORS -

## PRESENT STATUS

SILICON CONTROLLED RECTIFIER (SCR) - INTEGRATED TRANSISTOR GATE

\* FOCUS ON HIGH VOLTAGE/HIGH CURRENT - UTILITY APPLICATIONS

GATE CONTROLLED RECTIFIER (GTO) - INTEGRATED TRANSISTOR GATE

\* FOCUS ON IMPROVEMENT IN TURN ON/TURN OFF GAIN

BIPOLAR JUNCTION TRANSISTOR (BJT) - INTEGRATED TRANSISTOR BASE

\* FOCUS ON IMPROVING GAIN AT HIGH CURRENTS/HIGH VOLTAGE

\* FOCUS ON REDUCING OHMIC LOSS AND POWER DISSIPATION

FIELD EFFECT TRANSISTOR (FET) - MATERIALS IMPROVEMENT

## PRESENT IREND

MAJOR EMPIIASIS IN POWER SEMICONDUCTORS CONTINUES TO BE IN INTRODUCED 1500 VOLT/350 AMP DEVICE.

Figure A.2-6 Power Semiconductors Status

## ELECTRICAL SYSTEM COMPONENTS

## - MAGNETIC MATERIALS -

IMPACI	10-30% REDUCTION	PRESENT PRODUCTS	NEW
ENERGY PRODUCT	16-18 × 10 <sup>6</sup>	$28-32 \times 10^{6}$	$45-60 \times 10^{6}$
YEAR	1970	1978	1984
MATERIAL	SMARIUM COBALT 5	SMARIUM COBALT 217	NEODYM1UM-IRON-BORON

## TREND

PREDUCT 3-5 YEARS FOR NEODYMIUM-IRON TO BE PROMINENT IN MARKET. SHOWS GOOD PROMISE OF REDUCING COST AND USE OF CRITICAL MATERIALS. MAJOR PROBLEM WILL BE PROPER THERMAL CONTROL

Figure A.2-7 Magnetic Material Trends

## APPENDIX B

DATA GENERATION REPORTS

## B.1 Analytical Methods Used For Performance Analysis

Our performance analysis used validated computer programs to evaluate all significant factors when preparing performance predictions. Existing programs were adapted to meet the specific analysis requirements of this project. These existing programs were based on the principles of SAE recommended practice JASS, with appropriate modifications for tracked vehicles. The resulting programs produced the following specified data:

- 1. Tractive effort vs. speed
- 2. Acceleration
- 3. Startability on grades
- 4. Maximum speed on grades
- 5. Minimum turn radius vs. speed

The programs were integrated on a conservation of energy basis:

## [1] (Input HP - Loss HP) \* (Drive efficiency) = Power output

The input horsepower is the engine horsepower at its operating speed less the appropriate deductions for altitude, temperature, air cleaner, muffler and grills. The loss horsepower includes such items as cooling fan, auxiliary generator, hydraulic pumps and similar parasitic loads. The drive efficiency is measured from engine flywheel to sprocket to fairly assess added losses due to speed up transfer cases to drive high speed generators or high ratio final drives to match high speed motors. The power output to rolling resistance, windage (air resistance), grade resistance and turning losses.

The power budget for the input horsepower is as follows:

	Net input horsepower	495.0
3.	Air cleaner & muffler	- 5.0
2.	Conditions (standard)	- 0.0
1.	Rated engine horsepower	500.0

The power budget for parasitic losses is as follows:

1.	Net input horsepower	495.0
2.	Fan (sized for ballistic grills)	-46.2
3.	Auxiliary generator	- 5.8
4.	Hydraulic pump	- 3.0
	Net input horsepower	440.0

The drive efficiency is determined as follows:

- l. Generator (or alternator) efficiency is estimated from data for similar items and from manufacturer's estimates. Since these efficiencies are essentially constant at loads over 25% of rating, and the analysis is for full power, a fixed efficiency value is used for all calculations for any given generator type.
- 2. Power conditioning and control equipment, like the generator, have essentially constant efficiency under normal loads and are therefore also held at a fixed value that is based on data for similar items and on manufacturer's estimates.
- 3. Motor efficiencies under normal loads are primarily a function of armature speed (RPM). Curve fits have been made with correlation coefficients of at least 0.99 and the resulting equations are used to calculate the efficiency of each motor at each operating point of every operating condition. This detailed approach becomes particularly significant in turns, when each motor has its own individual efficiency at each operating point. Refer to Section 5.1.4.6, Figure 5.1.4.6-B for an example of the differentiations between systems that result from this precise analysis.
- 4. Power output must equal the sum rolling resistance, wind resistance, grade resistance and turn losses so steady state operation can exist. These values are determined as follows:
  - o Rolling resistance:

Rolling resistance has been based on a value of 100 pounds per ton, which has been found to be a reasonable value for tracked vehicles on smooth, hard surfaces.

[2] RR = GVW / 2000 \* Cr

Where:

RR = Rolling resistance in pounds
GVW = Gross veicle weight
Cr = Rolling resistance coefficient
( 100 pounds per ton for this study)

## o Wind resistance:

Wind resistance has been based on the specified frontal area, a drag coefficient (Cd) of 1.0, vehicle speed in MFH, and a coefficient of 1/391 for standard conditions (ref. Fluid Dynamic Drag, Dr.-Ing. Sighard Hoerner).

These values are used as follows:

[3]  $RW = Af * Cd * (MPH ^ 2) / 391$ 

Where:

Af = Frontal area in square feet Cd = Drag coefficient (estimated at 1.0) MPH = Vehicle speed, miles per hour

## o Grade resistance:

Grade resistance is calculated from the basic geometric considerations. The equation used is:

[4] Rg = GVW \* Sin (Atn (GR / 100))

Where:

Rg = Grade resistance in pounds GVW = Gross vehicle weight in pounds GR = Grade in per cent

## o Turning losses:

Turning losses consist of power dissipated in scrubbing the tracks around a turn and regeneration losses due to inefficiencies in the regeneration system. These values of scrub horsepower and regenerative horsepower are quantified using methods originated by Merritt and updated in TACOM Technical Report 10969, "Investigation of the Factors Involved in Steering Tracklaying Vehicles". As the method is complex, reference to this report is recommended for those who want the details of the analytical method. The "Scrub Horsepower" is applied directly as a loss. The regeneration loss is found by first determining regeneration efficiency from motor speed and controller efficiency, as is described for drive efficiency. Transfer Horsepower is then multiplied by the regeneration efficiency to determine the losses due to regeneration.

The above analytical methods have been integrated into a series of programs to solve for specific operating conditions such as tractive effort vs. speed, speed vs. time, speed vs. distance, maximum speed vs. grade, and minimum turning radius vs. speed. In each case the complexity of the calculation necessitates an iterative solution. The appropriate variable is increased until a power balance is reached and the requirements of equation [1] above are met. The performance and load values for that

particular operating point are then printed as required by the contract.

## B.2 Data Table Description

The tables in Appendix B provide detailed quantification of the results discussed in the report and the power train load and speed data required by the contract. The following tables tabulate the performance analysis data used in this report. Tables are organized to facilitate comparative analysis by grouping by type of performance, and presenting data for all of the various vehicle and drive types within that group. The data table groups are:

- A. Speed vs. grade and tractive effort
- B. Acceleration
- C. Sprocket and motor speeds and loads for maximum turn condition
- D. Gear speeds and loads at maximum turn condition
- E. Gear speeds and loads at maximum tractive effort condition

Within these groups are performance results for the following vehicle and drive types:

- 1. 19.5 ton, Configuration I, AC induction motor drive system
- 2. 19.5 ton, Configuration II. AC induction motor system
- 19.5 ton, Configuration I, DC homopolar system
- 4. 40 ton, Configuration I, AC induction motor drive system
- 5. 40 ton, Configuration II, AC induction motor drive system
- 6. 40 ton, Configuration I, DC homopolar system

Tables can be easily located by combining the heading letters and numbers from the above listings. As an example, acceleration data for the 19.5 ton, Configuration II, AC induction system is in table B-2.

## B.2.A Speed Vs Grade And Tractive Effort Tables

The following tables provide speed vs. grade data plus corresponding sprocket speeds and torques. They are divided into three sections consisting of Title Heading, Data Input and Results. The Title Heading provides in addition to the title, traceability data of program authors, revision data and run date.

The data input section inputs • general vehicle description parameters plus operational assumptions such as:

- 1. Maximum speed: A value of 45 MPH has been used as a contract requirement.
- Drag coefficient: A value of 1.0 has been used as a reasonable, yet conservative value throughout this study.
- Rolling resistance: A value of 100 pounds per ton has been used to represent operation on a smooth, hard surface.
- 4. Engine gross horsepower: Values of 500 and 1000 have been used for the 19.5 and 40 ton vehicles respectively as directed by the contract.
- 5. Engine loss horsepower: Values of 60 and 120 have been used for the 19.5 and 40 ton Vehicles respectively. See Section A.II.1 for a sample loss budget.

The results section of these tables provide the following data:

- 1. Grade (%): Increments have been selected to provide the range of data specified in the contract.
- 2. Speed (MPH): This is the maximum speed the vehicle can maintain on the specified grade.
- 3. Resistance (Pounds): This is the resistance encountered when operating at the stated speed on the stated grade and equals the tractive effort at this limiting condition.
- 4. Sprocket Torque and RPM: These data can be used to calculate torques and speeds required in related drivetrain components.

LIMITING GRADE PERFORMANCE (FOR ELECTRICAL DRIVE TRACKED VEHICLES)

KTUR ELELIKILAL UKIVE IRACKED VEHICLES)

BY: W.E. RODLER

L.M. FERNANDEZ

RUN DATE: 7-AUG-85111

DATA INPUT:

MAX. VEL., mph = 45.0 ENG. GROSS HP. = 500.0 FROWTAL AREA, sq. ft. = 57.0 ENG. LOSS HP. = 60.0 GROSS VEHICLE WI., lbs = 39000.0 TRACK PITCH, in = 6.03 DRAG CDEFFICIENT = 1.00 ND. DF SPROCKET TEETH = 11 RULLING RESISTANCE, lb per ten = 100.0

SPROCKET(1bft) 9681.58 8529.35 7229.22 \$792.50 4231.75 3418.64 2596.11 1780.58 1623.21 1468.80 1319.10 1254.27 SPROCKET(rpm) 85.45 98.14 117.89 151.64 211.97 265.63 351.28 560.86 617.29 511.50 683.26 716.42 RESISTANCE(1b) 19396.87 16442.23 9624.37 22019.54 13169.79 7775.86 1048.05 5901.62 3689.68 3338.64 2998.36 2853.53 SPEED(mph) 7.40 5.37 9.52 13.31 16.68 22.06 32.13 35.23 38.77 42.92 45.00 GRADE(T) 50.00 20.00 1.56 60.00 40.00 30.00 15.00 10.00 5.00 4.00 3.00 2.00

B-8

LIMITING GRADE PERFORMANCE (FOR ELECTRICAL DRIVE TRACKED VEHICLES)

(FOR ELECTRICAL DRIVE TRACKED VEHICLES)

87: W.E. RODLER REV.DATE: 11 JUNE 1984

1.M. FERNANDEZ

RUN DATE: 7-AUG-85:12

DATA INPUT:

= 500.0 60.0 = 6.03 TEETH = 11	**************************************	SPROCKET(16ft)	9669.09	8528.54	7228.49	5791.69	4231.07	3419.66	2594.78	1111.94	1620.11	1465.43
ENG. GROSS HP. * ENG. LOSS HP. * TRACK PITCH, in *	motor & CONCEPT STEER	SPROCKET(rpm)	83.60	95.86	115.10	147.95	207.27	259.54	344.00	501.40	550.02	606.16
MAX. VEL., mph = 45.0 FRONTAL AREA, sq. ft. = 57.0 GROSS VEHICLE WI., lbs = 39000.0 DRAG COEFFICIENT = 1.00 ROLLING RESISTANCE, lb per ton = 100.0	**************************************	RESISTANCE(1b)	22019.36	19396.62	16441.86	13169.16	9623.24	1114.02	5898.71	4042-16	3682.75	3330.80
MAX. VEL., mph = 45.0 FRONTAL AREA, sq. ft. = GROSS VEHICLE WI., lbs = DRAG COEFFICIENT = 1.00 ROLLING RESISTANCE, lb pe	ecesses es e	- SPEED(moh)	5.25	6.02	1.23	9.29	13.02	16.30	21.61	31.49	34.55	38.07
MAX. VEL., mph "FRONTAL AREA, sq. GROSS VEHTCLE WT. DRAG COEFFICIENT ROLLING RESISTANC	settessetesses Efficiency da by Crai	GRADECED	00*09	20.00	40.00	30.00	20.00	15.00	10.00	5.00	<b>6.</b> 00	3.00

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LIMITING GRADE PERFORMANCE (For electrical drive tracked vehicles)

(FOR ELECTRICAL DRIVE TRACKED VEHICLES)

87: W.E. RODLER REV.DATE: 11 JUNE 1984

1.M. FERNANDEZ

RUN DATE: 7-AUG-85:10

WPUT:	MAX. VEL., mph = 45.0 FRONTAL AREA, sq. ft. = 57.0 GROSS VEHICLE MI., lbs = 39000.0 TRACK PITCH, in = 6.03 DRAG CUEFFICIENT = 1.00 ROLLING RESISTANCE, lb per ton = 100.0	Efficiency data for Homopolar motor & CONCEPT I: TWIN given by Gene Seider 20-MAY-85 #PROPULSION MOTORS ####################################	SPEED(mph) RESISTANCE(1b) SPROCKET(rpm) SPROCKET(1bft)	5.07 22019.08 80.70 9669.14	5.82 19396.27 92.69 8529.64	7.01 16441.40 111.61 7229.25	9.05 13168.51 144.08 5790.40	12.65 9621.84 201.32 4231.09	15.81 7771.71 251.68 3417.52	20.91 5894.39 332.90 2592.41	30.25 4030.99 481.64 1773.07	33.01 3467.61 625.54 1413.12
DATA INPUT:	MAX. VEL., mph = 65. FRONTAL AREA, sq. ft. GROSS VEHICLE MI., t. DRAG COEFFICIENT = 1. ROLLING RESISTANCE,16	ciency data f Iven by Gene ***********************************	SPEED(mph)	5.07	5.82	7.01	9.05	12.65	15.81	20.91	30.25	13.01
DATA	MAX. VEL., mph FRONTAL AREA, s GROSS VEHICLE, DRAG COEFFICIEN ROLLING RESISTA	Efficia Olva sesespaneeseses RESULTS:	GRADECED	00.09	80.00	*0.00	30.00	20.00	15.00	10.00	\$.00	00**

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B**-1**0

GV: W.E. ROOLER REV.DATE: 11 JUNE 1984

RUN DATE: 12-AUG-85:106

	=1000.0 = 120.0 n = 7.63 T TEETH = 11	2. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	Efficiency data for Westinghouse induction motor a CONCEPT I: TWIN by Craig Joseph 10-MAY-85 a PROPULSION MOTORS PRESENTED AS A PROPULSION MOTORS PROPERTY PROPULS PROPERTY PROPE	SPROCKET(1bft)	25114.27	22119.23	18745.93	15016.77	10963.23	8846.72
	ENG. GROSS HP. =1000.0 ENG. LOSS HP. = 120.0 TRACK PITCH, in = 7.63 NO. OF SPROCKET TEETH = 11	****	motor & CONCEP \$ PROPUL ************************************	SPROCKET(rpm)	65.74	75.50	99.06	116.54	163.44	204.99
	MAX. VEL., mph = 45.0 FRONTAL AREA, sq. ft. = 60.3 GROSS VEHICLE WI., 15s = 80000.0 DRAG CUEFFICIENT = 1.00 ROLLING RESISTANCE,15 per ton = 100.0	************	Efficiency data for Westinghouse induction motor & CONCEPT I: by Craig Joseph 10-MAY-05 ####################################	RESISTANCE(16)	45164.42	39783.36	33720.31	27002.79	19718.71	15913.51
PUT:	MAX. VEL., mph = 45.0 FRONAL AREA, sq. ft. = GROSS VEHICLE WT., lbs = DRAG COEFFICIENT = 1.00 ROLLING RESISTANCE, lb pe	******	ency data for Westinghous by Craig Joseph 10-MAY-85 steamsteamsteamsteamsteamsteamsteamsteam	SPEED(mph)	5.22	9.00	7.20	9.26	12.98	16.28
DATA INPUT:	MAX. VEL., mph = 4 FRONTAL AREA, sq., 6 GROSS VEHICLE HT., DRAG COEFFICIENT = ROLLING RESISTANCE	***	Efficiency da by Crain by Crai	GRADECT)	60.00	50.00	40.00	30.00	20.00	15.00

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B-11

REV. DATE: 11 JUNE 1984 BY: W.E. RODLER L.M. FERNANDEZ

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RUN DATE: 12-AUG-85:107	,这种种种种种种种种种种种种种种种种种种种种种种种种种种种种种种种种种种种种	DATA INPUT:	MAX. VEL., mph = 45.0 FRONTAL AREA, sq. ft. = 68.3 GROSS VEHICLE WI., lbs = 80000.0 DRAG COEFFICIENT = 1.00 RULLING RESISTANCE, lb per ton = 100.0	在李林林林林林林林林林林林林林林林林林林林林林林林林林林林林林林林林林林林林

SPROCKET(1bft) 25091.81 22117.27 15014.99 18744.21 SPROCKET(rpm) 64.29 73.75 88.52 113.72 RESISTANCE(15) 45164.21 39783.07 33719.88 27002.07 SPEED(mph) 5.86 7.03 9.03 GRADE(%) 50.00 40.00 30.00

8850.32 3700.66 10962.05 6693.72 4541.53 4118.07 3291.05 3104.59 159.81 200.28 266.72 392.60 432.78 480.03 536.32 566.56 12038.63 19717.42 15911.41 8164.74 7403.70 6652.67 5916.42 5585.32 12.69 15.91 21.18 31.18 34.37 36.13 42.60 45.00 20.00 15.00 10.00 5.00 4.00 1.54 3.00 2.00

经未供债券 医医疗性医疗 医医性性性 医医性性 医克拉氏性 医克拉特氏 医克拉氏性 医克拉氏性 医克拉氏征 医克拉氏征 医克拉克氏征 医克拉克氏征 医克拉克氏征 医克拉氏征 医克拉氏征 医克拉氏征 医二甲基乙酰甲基乙酰甲基乙酰甲基乙酰甲基乙酰甲基乙酰甲基乙酰甲基乙酰甲基乙酰甲基乙酰	LEMITER GRADE PERFORMANCE
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BY: W.E. RODLER REV.DATE: 11 JUNE 1984 L.M. FERNANDEZ

RUN DATE: 12-AUG-85:105

DATA INPUT:

MAX. VEL., mph = .45.0
FRONTAL AREA, sq. ft. = .68.3
FRONTAL AREA, sq. ft. = .68.3
GROSS VEHICLE WT., lbs = .80000.0
DRAG COEFFICIENT = 1.00
ROLLING RESISTANCE, lb por ton = 100.0

Efficiency data for Homopolar meter a CONCEPT I: TWIN given by Gene Seider 20-MAY-85 aPROPULSION MOTORS sectebrate to the sectebrate to th

SPROCKET(16ft) 18746.69 15017.98 8846.90 25080.66 22120.61 10963.23 6690.93 4535.66 4110.52 3689.80 3275.36 2912.90 SPROCKET(rpm) 86.03 195.18 71.47 111.06 417.98 461.41 566.56 155.69 259.60 380.85 512.70 RESISTANCE(1b) 45163.93 39782.71 33719.41 27001.42 19715.98 15909-19 12034.51 8154.74 7389.82 6633.36 5889.14 5241.41 SPEED(mph) 6.83 45.00 5.68 8.82 12.37 15.50 20.62 30.25 33.20 36.65 40.72 4.94 GRADE(%) 15.00 50.00 40.00 30.00 20.00 10.00 5.00 4-00 3.00 2.00 1.11 60.00

在建设的表现的存在是实现的表现的现在分词是实现的现在分词是实现的现在分词是不是是不是不是不是不是不是不是不是不是不是不是的,我们们 End

B-13

## B.2.B Acceleration Tables

The following tables provide acceleration data consisting of time, tractive effort, speed, distance and sprocket RPM, torque and horsepower. These tables are divided into three sections consisting of the Title Heading, Data Input and Results. The Title Heading provides in addition to the subject, traceability data of program author, operator, purpose, revision date and run.date.

The Data Input section inputs general vehicle description parameters plus operational assumptions such as:

- Coefficient of drag: a value of 1.0 has been used as a reasonable, yet conservative value throughout this study. This coefficient is multiplied by the frontal area and the velocity head to provide air resistance.
- 2. Rolling resistance: a value of 100 pounds per ton has been used to represent operation on a smooth, hard surface. This value is multiplied by the gross vehicle weight in tons to obtain vehicle rolling resistance.
- 3. Coefficient of friction: a value of 0.7 has been used to represent the contact between the track and the roadway. This is used to limit the maximum possible acceleration to the value that the selected adhesive condition will allow.
- 4. Mass increment for rotation: This value has been calculated from the motor and gear train data. It is input as a fraction of the translational mass of the vehicle. In the calculations, the translational mass of the vehicle is increased by this amount to correct for the rotational inertia of the system.
- 5. Grade, %: This value is determined by the operating situation. Most calculations have used level (0%), but it was also used to confirm starting performance on a 60% grade.

The results section provides the following acceleration data:

- 1. Time (seconds): This is cumulative time from the start of the run. As directed by the contract, no allowance is made for throttle response time.
- Net tractive effort (pounds): This shows the tractive effort available at the corresponding time. It can be either power or adhesion limited.
- 3. Speed (MPH): This is the instantaneous speed at the given time.
- 4. Distance (feet): This is the cumulative distance from the start of the run.

5. Sprocket RPM, LB-FT, and HP: These data can be used to calculate speeds, torques and powers required in the related drive train components.

12.07 21.19 192.23 4793.51	6.10 122.90 7188.22	2.5.	INPUT:	W.E. RODLER OPERATOR:R LEWIS PROPOSAL RUN DATE: 31 MAY 1995 R.E.LEWIS PURPOSE:ELECTRIC DRIVE PROPOSAL RUN DATE:7-AUG-85:14 ************************************	70.60 105.89 141.18 160.12 165.18 166.77 168.21		12008.04 12008.04 12008.04 10896.15 9422.76 8428.95 7723.67	15.45 30.88 46.31 61.75 77.18 91.07 102.93 113.40 122.90	0.14 0.43 1.42 2.13 2.97 4.97 6.10	1.94 1.94 2.91 3.88 4.85 5.72 6.46 7.72	25349.86 25349.45 25348.77 25347.81 22818.72 19467.64 17206.92 15602.17 14383.55
		SPEED DISTANCE SPRUCKET SPRUCKET SPRUCKET SPRUCKET (hp. ft. each)	CLE WEIGHT, lbs. = 39000.  CLE WEIGHT, lbs. = 45.0  SANCKET TEETH = 11  COEFFICIENT OF FRICTION = 0.70  SANCKET TEETH = 11  COEFFICIENT OF FRICTION = 0.70  SANCKET TEETH = 11  COEFFICIENT OF FRICTION = 0.70  CARDELLY CORPERITE TO THE CORPETIT TO THE CORPERITE TO THE CORPETIT TO THE COR	### CORPERTION FOR THE CORPETITION OF PARK FOR THE CORPETITION OF PARK FOR THE CORPETITION FALL CORPETITION	177. 39					9	6837.88
	10.531	SPEED DISTANCE SPRUCKET SPRUCKET (nb-ft each) (10-00 0.00 0.01 12008.04 0.97 0.14 15.45 12008.04 1.94 0.43 30.88 12008.04 2.91 0.85 46.31 12008.04 4.85 2.13 77.18 10896.15 5.72 2.97 91.07 94.22.76 6.46 33.92 102.93 8428.95	WEIGHT, 1bs = 39000.         ROLLING FRICIENT OF DRAG = 1.00         MASS INCR. FOR ROT. % = 1.00           Fr. s. 40.0         ROLLING FRICIENT OF FRICTION = 0.70         GRADE, % = 0.00           In. = 57.0         COEFFICIENT OF FRICTION = 0.70         GRADE, % = 0.00           in. = 57.0         COEFFICIENT OF FRICTION = 0.70         GRADE, % = 0.00           in. = 57.0         COEFFICIENT OF FRICTION = 0.70         GRADE, % = 0.00           in. = 57.0         COEFFICIENT OF FRICTION = 0.70         GRADE, % = 0.00           in. = 57.0         COEFFICIENT OF FRICTION = 0.70         GRADE, % = 0.00           in. = 57.0         COEFFICIENT OF FRICTION = 0.70         GRADE, % = 0.00           in. = 57.0         COEFFICIENT OF FRICTION = 0.70         GRADE, % = 0.00           in. = 57.0         COEFFICIENT OF FRICTION = 0.70         GRADE, % = 0.00           in. = 57.0         COEFFICIENT OF FRICTION = 0.70         GRADE, % = 0.00           in. = 57.0         COEFFICIENT OF FRICTION = 0.70         Grade, % = 0.00           in. = 57.0         COEFFICIENT OF FRICTION = 0.70         GRADE, % = 0.00           in. = 5.4         In. = 1.00         COLD         GRADE, % = 0.00           in. = 5.7         COLD         COLD         GRADE, % = 0.00           in. = 6.45         In. = 6.00         GRADE, % = 0.00		166.77	Ä	1723.67	113.40	4.97	1.12	71.20
1.12 4.97 113.40 7723.67	4.97 113.40 7773.47	SPEED DISTANCE SPRUCKET SPRUCKET (mph) (ft) (ft) (lb-ft each) (0.00 0.00 1.2008.04 1.94 0.43 30.88 1.2008.04 2.91 0.85 . 46.31 1.2008.04 4.85 2.13 77.18 10896.15 5.72 2.97 91.07 94.22.76	E WEIGHT, 1bs = 39000. ROLLING FESTSTANCE, 1bton = 100.0 GRADE, T = 0.00 GRADE	## EEGHT.   Da	165.18		8428.95	102.93	3.92	9.46	206.92
6.46 3.92 102.93 8428.95 7.12 4.97 113.40 7723.67	3.92 102.93 8428.95 4.97 113.40 7723.47	SPEED DISTANCE SPROCKET SPROCKET (nph) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1	LE WEIGHT, lbs. 39000.  LE WEIGHT, lbs. 45.0  TRACK PITCH, lb. 10.0  S HP. 2 40.0  COEFFICIENT OF FRICTION = 0.70  A. 1n. 2 57.0  A. 1n. 3 57.0  A. 1n. 3 58.0  A. 1n. 4 57.0  A. 1n. 4 57.0  A. 1n. 5 57.0  A. 1n. 5 57.0  A. 1n. 5 57.0  A. 1n. 6 57.0  A. 1n. 6 57.0  A. 1n. 7 57.0  A. 1n. 7 57.0  A. 1n. 8 57.0  A. 1n. 9 6.0  B. 12008.04  B. 12008.04  B. 12008.04  B. 141.18  B. 142.0  B. 142.0  B. 142.0  B. 142.0  B. 160.1  B. 1	New   Company	163.40	À	9422.76	91.07	2.97	5.72	9467.64
5.72 2.97 91.07 9422.76 6.46 3.92 102.93 8428.95 7.12 4.97 113.40 7723.67	2.97 91.07 9422.76 3.92 102.93 8428.95	SPEED DISTANCE SPROCKET SPROCKET (mph) (ft) (cpm) (lb-ft each) (0.00 0.00 0.01 12008.04 0.97 0.14 15.45 12008.04 1.94 0.43 30.88 12008.04 2.91 0.85 46.31 12008.04 33.88 1.42 61.75 12008.04	LE WEIGHT, lbs = 39000.  LE WEIGHT, lbs = 45.0  COLING REISTANCE, lb/ton = 100.0  S. MP. = 45.0  IRACK PITCH, in. = 6.03  S. MP. = 45.0  IRACK PITCH, in. = 6.03  A, in. = 57.0  data for Westinghouse induction motor #CONCEPT I: TWIN DRIVE MOTORS  alg Joseph 10-MAY-85  safg Jo	Neutrice	160.12	•	10896.15	17.18	2.13	4.85	2818-72
4.85     2.13     77.18     10896.15       5.72     2.97     91.07     9422.76       6.46     3.92     102.93     8428.95       7.12     4.97     113.40     7723.67	2.97 91.07 9422.76 3.92 102.93 8428.95	SPEED DISTANCE SPROCKET SPROCKET (mph) (ft) (ft) (lb-ft each) (0.00 0.00 12008.04 0.97 0.14 15.45 12008.04 1.94 0.43 12008.04 2.91 0.85 46.31 12008.04	LIE WEIGHT, 1bs = 39000.  COEFFICIENT OF DRAG = 1.00  DOITY, mph = 45.0  ROLLING RESISTANCE, 1b/ton = 100.0  SS HP. = 460.0  TRACK PITCH, in. = 6.03  SS HP. = 460.0  TRACK PITCH, in. = 6.03  GRADE, T = 0.0  LOEFFICIENT OF FRICTION = 0.70  data for Westinghouse induction motor #CONCEPT I: TWIN DRIVE MOTORS  alg Joseph 10-HAT-85  setg Joseph 10	INPUT:	141.18	÷	12008.04	61.75	1.42	3.88	25347.81
3.88 1.42 61.75 12008.04 4.85 2.13 77.18 10896.15 5.72 2.97 91.07 9422.76 6.46 3.92 102.93 8428.95 7.12 4.97 113.40 7723.67	1.42 61.75 12008.04 2.13 77.18 10896.15 2.97 91.07 9422.76 3.92 102.93 8428.95	SPEED DISTANCE SPROCKET SPROCKET (mph) (ft) (rpm) (lb-ft each) (0.00 0.01 12008.04 0.97 0.14 15.45 12008.04 1.94 0.43 30.88	LE WEIGHT, lbs = 39000.  COEFFICIENT OF DRAG = 1.00  ROLLING RESISTANCE, lb/ton = 100.0  SS MP. = 440.0  TRACK PITCH, in. = 6.03  SS MP. = 440.0  TRACK PITCH, in. = 6.03  As in. = 57.0  As in. = 50.0  As in. = 6.03  As in. = 6.03  As in. = 6.03  BRACK FITION = 0.00  Company of the same of t	NPUT:	105.89	<b>—</b>	12008.04	46.31	. 58.0	2.91	15348.77
2.91 0.85 46.31 12008.04 3.88 1.42 61.75 12008.04 4.85 2.13 77.18 10896.15 5.72 2.97 91.07 9422.76 6.46 3.92 102.93 8428.95 7.12 4.97 113.40 7723.67	1.42 61.75 12008.04 2.13 77.18 10896.15 2.97 91.07 9422.76 3.92 102.93 8428.95	SPEED DISTANCE SPRUCKET SPRUCKET (mph) (ft) (ft) (lb-ft each) (0.00 0.00 0.01 12008.04 0.97 0.14 15.45 12008.04	LLE WEIGHT, 1bs = 39000.  LOCITY, mph = 45.0  ROLLING RESISTANCE, 1b/ton = 100.0  SS MP. = 440.0  SS MP. = 440.0  TRACK PITCH, 1n. = 6.03  SPROCKET TEETH = 11  COEFFICIENT OF FRICTION = 0.70  GRADE, % = 0.0  GRADE, % = 0.0	COEFFICIENT OF DRAG = 1.00  LE WEIGHT, 1bs = 39000.  COEFFICIENT OF DRAG = 1.00  MASS INCR. FOR RDT, % = 47.20  SS H2. = 46.0  TRACK PITCH, 1b. = 6.03  SROCKET TEETH = 11  COEFFICIENT OF FRICTION = 0.70  GRADE, % = 0.0  COEFFICIENT OF FRICTION = 0.70  GRADE, % = 0.0  COEFFICIENT OF FRICTION = 0.70  GRADE, % = 0.0  COEFFICIENT OF FRICTION = 0.70  GRADE, % = 0.0  COEFFICIENT OF FRICTION = 0.70  GRADE, % = 0.0  COEFFICIENT OF FRICTION = 0.70  GRADE, % = 0.0  COEFFICIENT OF FRICTION = 0.70  GRADE, % = 0.0  GR	10.60		12008.04	30.88	0.43	1.94	25349.45
1.94     0.43     30.88     12008.04       2.91     0.85     . 46.31     12008.04       3.88     1.42     61.75     12008.04       4.85     2.13     77.18     10896.15       5.72     2.97     91.07     9422.76       6.46     3.92     102.93     8428.95       7.12     4.97     113.40     7723.67	0.43 30.88 12008.04 0.85 46.31 12008.04 1.42 61.75 12008.04 2.13 77.16 10896.15 2.97 91.07 9422.76 3.92 102.93 8428.95	SPEED DISTANCE SPRUCKET SPRUCKET (mph) (ft) (rpm) (lb-ft each) 0.00 0.00 0.01 12008.04	LE WEIGHT, lbs = 39000.  COEFFICIENT OF DRAG = 1.00  SS HP. = 440.0  SS HP. = 45.0  TRACK PITCH, in. = 6.03  SPROCKET TEETH = 11  COEFFICIENT OF FRICTION = 0.70  GRADE, T = 0.0  GRADE, T = 0	LE WEIGHT, lbs = 39000.  LE WEIGHT, lbs = 45.0  ROLLING RESISTANCE, lb/ton = 100.0  ROLLING RESISTANCE, lb/ton = 100.0  RAPLE WEIGHT, lbs = 45.0  RAPLE WEIGHT, lbs = 45.0  RAPLE WEIGHT OF FRICTION = 100.0  GRADE, T = 0.0  GRADE, T = 47.20  GRADE, T = 0.0  GRADE, T = 47.20  GRADE, T = 47.20  GRADE, T = 0.0  GRADE, T = 47.20  GRADE, T = 47.20  GRADE, T = 0.0  GRADE, T = 47.20  GRADE, T = 0.0  GRADE, T = 0.0  GRADE, T = 47.20  GRADE, T = 0.0  GRADE, T = 47.20  GRADE, T = 0.0  GRADE, T = 47.20  GRADE, T = 47.20  GRADE, T = 0.0  GRADE, T = 47.20  GRADE, T = 0.0  GRADE, T = 47.20  GRADE, T = 0.0  GRADE, T = 47.20  GRAD				15.45	0.14	16.0	5349-86
0.97 0.14 15.45 12008.04 1.94 0.43 30.88 12008.04 2.91 0.85 . 46.31 12008.04 3.88 1.42 61.75 12008.04 1.85 2.13 77.18 10896.15 5.72 2.97 91.07 9422.76 6.46 3.92 102.93 8428.95 1.12 4.97 113.40 7723.67	0.14 15.45 12008.04 0.43 30.88 12008.04 1.42 61.75 12008.04 1 2.13 77.18 10896.15 1 2.97 91.07 9422.76 1 3.92 102.93 8428.95 1	SPEED DISTANCE SPROCKET SPROCKET (mph) (ft) (rpm) (lb-ft each)	LE WEIGHT, 1bs = 39000.  CCITY, mph = 45.0  ROLLING RESISTANCE, 1b/ton = 100.0  S. MPs. = 440.0  TRACK PITCH, in. = 6.03  GRADE, T = 0.0  RALLING RESISTANCE, 1b/ton = 100.0  GRADE, T = 0.0	LE WEIGHT, 1bs = 39000.  LE WEIGHT, 1bs = 45.0  COITY mph = 45.0  TRACK PITCH, 1n = 100.0  SHOUS TRACK PITCH, 1n = 6.03  SHOUS TRACK PITCH, 1n = 6.03  PROCKET TEETH = 11  COEFFICIENT OF FRICTION = 0.70  GRADE, T = 0.0  A, in = 57.0  As in = 57.0  TRACK PITCH II TWIN DRIVE MOTORS  *** An = 57.0  ** An = 57.0  *** An = 57	35.31		12008.04			•	
0.00 0.00 1.008.04 0.97 0.14 15.45 12008.04 1.94 0.43 30.88 12008.04 3.88 1.42 61.75 12008.04 4.85 2.13 77.18 10896.15 5.72 2.97 91.07 9422.76 6.46 3.92 102.93 8428.95	0.14 15.45 12008.04 3 0.43 30.88 12008.04 7 0.85 46.31 12008.04 10 1.42 61.75 12008.04 14 2.13 77.18 10896.15 16 2.97 91.07 9422.76 16 3.92 102.93 8428.95 16		LE WEIGHT, 1bs = 39000. COEFFICIENT OF DRAG = 1.00 SINCR. FOR RDT. \$ =47.20 SINP. = 440.0 TRACK PITCH, 1n. = 6.03 SPROCKET TEETH = 11 COEFFICIENT OF FRICTION = 0.70 GRADE, \$ = 0.0  As in. = 57.0  alg Joseph 10-MAY-85  *** *** *** *** *** *** *** *** ***	LE WEIGHT, lbs = 39000. COEFFICIENT OF DRAG = 1.00  OCITY, mph = 45.0  ROLLING REJISTANCE, lb/ton = 100.0  IS MP. = 440.0  TRACK PITCH, in. = 6.03  S. MP. = 45.0  TRACK PITCH, in. = 6.03  A, in. = 57.0  data for Westinghouse induction motor #CONCEPT I: TWIN DRIVE MOTORS  alg Joseph 10-MAY-85  ***********************************	0.02 35.31		12008.04	0.01	0.00	00.0	5350.00
TS:  NET 7.E. SPEED DISTANCE SPRUCKET S	SPEED   DISTANCE   SPRUCKET   SPRUCKET   SPRUCKET	nata   natural   natural	39000	INPUT: 	reconstant to the PROCKET of each)	## dd S	SPROCKET (1b-ft each) 12008.04	SPRUCKET (rpm)	DISTANCE (ft)	2	75: 75: 75: 75: 75: 75: 75: 75: 75: 75:
Net   Real Brook	FR	BY: W.E. RODLER  R.E.LEWIS  PURPOSE:ELECTRIC DRIVE PROPOSAL  RUN DATE:7-AUG-85:14  RUN DATE:7-AUG-85:14  RUN DATE:7-AUG-85:14  BAT INPUT:	W.E. RODLER OPERATOR:R LEWIS REV.DATE: 31 MAY 1985 R.E.LEWIS PURPOSE:ELECTRIC DRIVE PROPOSAL RUN DATE:7-AUG-85:14 Idaseasasasasasasasasasasasasasasasasasas		*DATE: 31 MAY 1995 N DATE: 7-AUG-85:14 seesetteteeseteeteeteeteeteeteeteeteetee	REVADOR MASS  WASS  WASS  CRADE  SPEC	######################################	LECTRIC DRIV  ***********************************	OPERATOR:R PURPOSE:E E**********************************	eetteeteeteeteeteeteeteeteeteeteeteetee	M.E. RODLE R.E.LEWIS seetteenseet INDUT: ICLE WEIGHT ICLE WEIGHT SPROCKET T SPROCKET SPROCKET T SPR

TINE (sec)	NET T.E.	SPEED (mph)	DISTANCE (ft)	SPRUCKET (rpm)	SPROCKET (1b-ft each)	SPROCKET (hp each)
2.00	4885.13	19.51	92.85	310.60	3030.87	179.24
00.9	4302.27	21.27	122.91	338.66	2779.11	179.20
1.00	3857.91	22.84	155.39	363.58	2588.08	179.16
8.00	3504.53	24.25	190.04	386.06	2436.91	179.13
9.00	3214.72	25.54	226.66	406.58	2313.55	179.10
10.00	2971.43	26.72	265.08	455.46	2210.51	179.07
11.00	2763.38	21.82	305.18	442.97	2122.85	179.05
12.00	2582.82	28.85	346.82	459.29	2047.15	179.02
13.00	2424.18	29.81	389.91	474.57	1980.98	179.00
14.00	2283.37	30.71	434.37	488.93	1922.55	178.98
15.00	2157.31	31.56	480.10	502.48	1670.50	178.96
16.00	243.59	32.37	\$27.05	515.30	1823.78	178.94
17.00	1940.35	33.13	575.14	527.46	1781.57	178.92
18.00	1846.08	33.86	624.32	539.01	1743.23	178.91
19.00	1759.58	34.55	674.54	550.01	1708.21	178.89
20.00	1679.86	35.21	125.75	560.50	1676.09	178.87
21.00	1606.09	35.84	117.89	570.52	1646.51	178.86
22.00	1535.51	36.44	830.94	580.11	1618.26	178.74

11ME (30C)	NET T.E. (1bs)	SPEED (mph)	DISTANCE (†t)	SPROCKET (rpm)	SPROCKET (1b-ft each)	SPROCKET (hp each)
23.00	1469.14	37.01	884.85	589.27	1591.77	176.60
24.00	1407.25	37.56	939.59	598.04	1567.18	178.45
25.00	1349.37	38.09	995.11	606.45	1544.29	178.32
26.00	1295.11	38.60	1051.39	614.52	1522.91	178.19
27.00	1244-12	39.09	1108.40	622-26	1502.91	178.07
28.00	1196.12	39.55	1166.10	629.10	1484.15	177.95
29.00	1150.83	40.00	1224.48	636.86	1466.52	177.83
30.00	1108.03	*****	1283.50	643.75	1449.93	177.72
31.00	1067.51	40.85	1343.14	650.38	1434.28	177-61
32.00	1029.09	41.25	1403.38	656.77	1419.50	177.51
33.00	992.62	41.64	1464.20	662.94	1405.51	177.41
34.00	957.95	42.01	1525.58	68.899	1392.26	177.32
35.00	924.94	42.38	1587.49	614.63	1379.70	177.22
36.00	893.49	42.72	1649.93	680.17	1367.77	177.14
37.00	863.49	43.06	1712.86	685.53	1356.42	177.05
38.00	834.83	43.39	1776.28	690.71	1345.62	116.97
39.00	807.44	43.70	1840.16	695.71	1335,33	176.89
40.00	781.24	66 44		1		

TIME (Sec)	NET T.E. (1bs)	SPEED (mph)	DISTANCE (ft)	SPRUCKET (rpm)	SPROCKET (1b-ft each)	SPROCKET (hp each)
11.00	756.15	44.30	1969.28	705.25	1316.14	176.73
00.21	732.10	44.58	2034.48	109.78	1307.19	176.66
43.00	109.04	44.86	2100.09	714.18	1298.63	176.59
43.50	697.36	45.00	2146.25	716.42	1294.30	176.55

			VEHICLE ACC	serreverenceserranterosantereserrenteres Vehicle acceleration characteristics	reessades RACTERISTICS	·*************************************
8 Y :	: W.E. RODLER R.E.LEWIS	œ	OPERATOR:R PURPOSE:EL	UPERATOR:R LEWIS PURPOSE:ELECTRIC DRIVE PROPOSAL	PROPUSAL	REV.DATE: 31 MAY 1985 Run Date:7-Jul-85:15
***	***		****	**********	**************	· 赛日本国家安全实验的安全的安全的安全的安全的安全的安全的安全的安全的安全的安全的安全的安全的安全的
P	DATA IMPUT:	٠				
•						
GROSS V MAXIMUM ENGINE - NUMBER - FRONTAL	GROSS VEHICLE WEIGHT, 15s = 3 MAXIMUM VELOCITY, mph = 45.0 ENGINE GROSS HP. = 440.0 NUMBER OF SPROCKET TEETH = 11 FRONTAL AREA, in. = 57.0	f, 1bs = 39000. bh = 45.0 40.0 FEFH = 11 57.0		COEFFICIENT OF DRAG = ROLLING RESISTANCE, 1b/ton = 10 TRACK PITCH, in, = 6.03 COEFFICIENT OF FRICTION = 0.70	J DRAG = 1.00 /ton = 100.0 13 10N = 0.70	MASS INCR. FOR ROTS \$ #47.20 Grade, \$ = 0.0
Efficies bi	ncy data for y Craig Josep ettottettet	Westinghouse in 10-MAY-85	Induction mot	or ±CONCEPT ]	Efficiency data for Westinghouse induction motor aconcept II: PROPULSION/STEER MOTOR by Craig Joseph 10-MAY-85 assestatestatestatestatestatestatestate	Efficiency data for Westinghouse induction motor aCONCEPT II: PROPULSION/STEER MOTOR by Craig Joseph 10-MAY-85 ************************************
<b>a</b> c	RESULTS:					
TINE (30C)	NET T.E. (1bs)	SPEED (APPh)	DISTANCE (ft)	SPROCKET (rpm)	SPROCKET (1b-ft each)	SPROCKET (hp each)
0.10	25350.00	0.00	0.00	10.0	12008.04	0.02
0.20	25349.86	0.97	0.14	15.45	12008.04	35.31
0.30	25349.45	1.94	0.43	30.88	12008.04	70.60
0.40	25348.77	2.91	0.85	46.31	12008.04	105.89
0.50	25347.81	3.68	1.42	61.75	12008.04	141.18
0.60	22352.57	4.85	2.13	17.18	10559.16	155.17
0.10	18903.04	5.69	2.97	90.61	9174.39	158.27
0.80	16747.82	6.41	3.91	102.11	8226.97	159,96
0.0	15207.34	7.05	+6.4	112.31	7549.93	161.45
1.00	14032.38	7.64	90.9	121.57	1033.67	162.81
2.00	8744.13	11.89	20.95	189.34	4712.94	169.91
3.00	6698.23	14.84	40.86	236.25	3818.09	171.75
00.4	5564.87	17.19	64.57	273.65	3324.40	173.22

TIME	NET T.E.	SPEED	DISTANCE	SPROCKET	SPROCKET	SPROCKET
(385)	(891)				(438) 11-01)	
9.00	4789.87	19.18	91.43	305.31	2988.15	173.71
90.9	4216.87	20.91	120.97	332.82	2740.55	173.67
7.00	3780.05	22.44	152.89	357.24	2552.68	173.63
00.8	3432.69	23.82	186.93	379.27	2403.99	173.60
9.00	3147.85	25.08	15.22	399.36	2282-66	173.57
10.00	2908.75	26.25	260.64	417.85	2181.32	173.55
11.00	2704.33	27.32	300.02	434.98	2095.10	173.52
12.00	2526.94	28.33	340.91	450.95	2020.65	173.50
13.00	2371.11	29.26	383.22	465.90	1955.58	173.48
14.00	2232.82	30.15	426.85	419.95	1898.11	173.46
15.00	2109.03	30.98	471.75	493.20	1846.92	173.44
16.00	1997.38	31.77	517.82	505.73	1600.98	173.42
17.00	1896.03	32.51	565.02	517.61	1759.47	173.40
18.00	1803.51	33.22	613.28	528.89	1721.77	173.39
19.00	1718.63	33.90	662.55	539.64	1687.34	173.37
20.00	1640.41	34.54	712.79	549.88	1655.75	173.36
21.00	1568.04	35.15	763.95	559.67	1626.67	173.34
22.00	1500.85	35.74	815.98	569.03	1599.79	173,33

j 						
TIME (Sec)	NET T.E.	SPEED (mph)	DISTANCE (ft)	SPROCKET (rpm)	SPROCKET (16-ft each)	SPROCKET (hp each)
23.00	1436.85	36.31	868-86	517.99	1574.24	173.25
24.00	1376.04	36.84	922.55	586.57	1550.02	173.11
25.00	1319.18	37.36	917.00	594.79	1527.47	172.99
26.00	1265.89	37.86	1032.20	602.68	1506.41	172.86
27.00	1215.82	36.33	1088.11	610.24	1486.72	172.75
28.00	1168.70	38.79	1144.70	617.52	1468.24	172.63
29.00	1124.24	39.23	1201.94	624.51	1450.89	172.52
30.00	1082.24	39.65	1259.82	631.24	1434.55	172.42
31.00	1042.49	40.04	1318.30	637.72	1419.15	172.32
32.00	1004.81	40.45	1377.37	643.96	1404.60	172.22
33.00	969.04	40.83	1437.00	86.649	1390.83	172-13
34.00	935.04	41.19	1497.17	655.78	1377.80	172.04
35.00	902.68	41.54	1557.87	661.39	1365.43	171.95
36.00	871.85	41.88	1619.08	08.999	1353.69	171.87
37.00	842.44	42.21	1680.77	672.02	1342.52	171.78
38.00	814.36	42.53	1742.94	677.08	1331.90	171.71
39.00	787.53	45.84	1805.57	681.96	1321.77	171.63
40.00	761.86	43.13	1868.63	686.68	1312-12	171.56

TIME (Sec)	NET T.E. (16s)	SPEED (mph)	DISTANCE (ft)	SPROCKET (rpm)	SPRUCKET (1b-ft each)	SPROCKET (hp each)
41.00	137.29	43.42	1932.13	691.25	1302.90	171.48
42-00	113.74	43.70	1996.03	695.68	1294.10	171.42
43.00	691.16	43.97	2060.34	96*669	1285.68	171.35
44.00	669.50	44.23	2125.04	704.11	1277.62	171.28
45.00	648.70	44.48	2190.11	708.13	1269.91	171.22
00-94	628.71	44.72	2255.54	712.02	1262.52	171.16
47.00	69.609	96.94	2321.33	715.80	1255.43	171.10
47.10	606.35	45.00	2341.13	716.42	1254.27	171.09

		* * * * * * * * * * * * * * * * * * *	VEHICLE ACC	ELERATION CH	VEHICLE ACCELERATION CHARACTERISTICS	**************************************
8 ×	: W.E. RODLER R.E.LEWIS		OPERATOR:R Purpose:El	OPERATOR:R LEWIS PURPOSE:ELECTRIC DRIVE PROPOSAL	PROPOSAL	REV.DATE: 31 MAY 1985 Run Date:7-Aug-85:13
0.41	escacececeses Data INPUT:	******	****	****	****	等条件的专家的专作的专家的专家的专家的专家的专家的专家的专业的专作的专业的专作的专业的专作的专业的专业的专业的专业的专业的专业的专业的专业的专业的专业的专业的专业的专业的
GROSS VI MAXIMUM ENGINE NUMBER FRONTAL	GROSS VEHICLE MEIGHT, 15s = MAXIMUM VELOCITY, mph = 45.0 ENGINE GROSS HP. = 440.0 NUMBER OF SPROCKET TEETH = 11 FRONTAL AREA, in. = 57.0	. lbs = 39000. h = 45.0 40.0 EETH = 11 57.0		COEFFICIENT OF DR/ ROLLING RESISTANCE, 1b/ton TRACK PITCH, in. = 6.03 COEFFICIENT OF FRICTION =	COEFFICIENT OF DRAG = 1.00 ROLLING RESISTANCE, 1b/ton = 100.0 TRACK PITCH, in. = 6.03 COEFFICIENT OF FRICTION = 0.70	MASS INCR. FOR ROT, % =28.40 Grade, % = 0.0
Ē ***	fficiency date given by Geresessesses	Efficiency data for Homopolar metor given by Gene Seider 20-MAY-85 ************************************	motor V-85 *******	#CONCEPT I: # **************	#CONCEPT I: TWIN DRIVE MOTORS	Efficiency data for Homopolar motor &CONCEPT I: TWIN DRIVE MOTORS given by Gene Seider 20-MAY-85 ####################################
<b>2</b>	RESULTS:					
TIME (Sec)	NET T.E. (1bs)	SPEED OF	DISTANCE (ft)	SPROCKET (rpm)	SPROCKET (16-ft each)	SPROCKET (hp each)
0.10	25350.00	0.00	00.0	0.01	12008.04	0.02
0.20	25349.82	11.11	0.16	17.70	12008.04	40.48
0.30	25349.28	22.2	67.0	35.40	12008.04	80.93
0.40	25348.38	3.33	96.0	53.09	12008.04	121.39
0.50	23607.38	4.45	1.63	10.79	11242.81	151.53
0.60	19175.76	5.48	2.43	87.26	9294.20	154.42
0.10	16631.74	6.32	3.36	100.65	8175.83	156.68
0.80	14916.52	7.05	0+-+	112.26	7422.01	158.64
0.00	13654.31	1.11	5.53	122.67	6867.44	160.40
1.00	12671.76	8.30	6.74	132.20	6435.88	162.00
2.00	1907.54	12.71	22.13	202.31	4346.24	167.42
3.00	6052.60	15.77	43.94	250.99	3535.92	168.98
4.00	5000.64	18.19	80.69	289.66	3078.50	169.78

A 1	RESULTS (continued):	:(p•n				RESULTS (centinued):
TIME (Sec)	NET T.E. (168)	SPEED (mph)	DISTANCE (ft)	SPROCKET (rpm)	SPROCKET (16-ft each)	SPROCKET (hp each)
5.00	4277.75	20.23	91.45	322.14	2765.56	169.63
9.00	3756.23	22.00	128.58	350.27	2540.95	169.46
1.00	3355.93	23.57	162.13	375.18	2369.45	169.26
9.00	3036.46	24.97	197.85	397.56	2233.31	169.05
9.00	2772.28	26.25	235.52	417.90	2121.30	168.79
10.00	2550.06	27.42	274.97	436.53	2027.58	168.53
11.00	2359.36	28.50	316.07	453.71	1947.57	168.25
12.00	2194.10	29.50	358.68	469.65	1878.60	167.99
13.00	148.68	30.43	402.71	484.50	1818.23	167.73
14.00	1916.70	31.30	448.05	498.38	1764.51	167.44
15.00	1799.76	32.12	494.63	511.39	1715.51	167.04
16.00	1692.13	32.89	542.37	523.61	1671.37	166.63
17.00	1594.87	33.61	\$91.19	535.11	1631.67	166.25
18.00	1506.46	34.29	641.05	545.96	1595.75	165.88
19.00	1425.31	34.94	691.87	556.22	1562.92	165.52
20.00	1349.89	35.55	743.60	565.93	1532.50	165.13
21.00	1280-22	36.13	196.21	575.13	1504.51	164.75
22.00	1215.02	36.67	849.64	583.85	1478.39	164.35

11ME (50C)	NET T.E. (1bs)	SPEED (mph)	DISTANCE (ft)	SPROCKET (FPM)	SPROCKET (1b-ft each)	SPROCKET (hp each)
23.00	1154.66	37.19	903.85	592.14	1454.31	163.97
24.00	1098.61	37.69	958.80	600.02	1432.03	163.60
25.00	1046.41	38.16	1014.46	607.53	1411.36	163.26
26.00	1002-02	38.61	1070.80	614.69	1394.05	163.16
27.00	954.99	39.04	1127.77	621.53	1375.50	162.78
28.00	910.96	39.45	1185.37	628.06	1358.20	162.42
29.00	869.67	39.84	1243.54	634.29	1342.03	162.08
30.00	830.87	40.21	1302.28	640.23	1326.88	161.75
31.00	794.29	40.57	1361.55	645.92	1312.64	161.43
32.00	759.56	40.91	1421.33	651.35	1299.15	161.12
33.00	726.80	41.24	1481.61	656.55	1286.46	160.82
34.00	695.84	41.55	1542.34	661.52	1274.50	160.53
35.00	966.56	41.85	1603.53	62.999	1263.22	160.26
36.00	638.82	+1.2+	1665.14	670.85	1252.56	159.99
37.00	612.52	42.41	1727.17	675.23	1242.48	159.74
38.00	587.56	42.68	1789.59	679.42	1232.94	159.50
39.00	563.85	42.93	1852.39	683.45	1223.90	159.27
40.00	541.30	43.17	1915.55	687.31	1215.32	159.05

TIME (Sec)	NET T.E. (168)	SPEED (mph)	DISTANCE	SPROCKET (rpm)	SPROCKET (16-ft each)	SPROCKET (hp each)
41.00	,19.84	43.40	1979.05	691.02	1207-18	158.83
42.00	499.41	43.63	2042.90	63.78	1199.44	158.63
43.00	479.93	43.84	2107.06	698.01	1192.08	158.43
44.00	461.36	44.05	2171.53	701.30	1185.07	158.24
45.00	443.63	44.25	2236.30	104.47	1178.40	158.06
46.00	426.70	****	2301.35	107.51	1172.04	157.89
47.00	410.52	44.62	2366.68	710.44	1165.98	157.72
48.00	395.06	44.80	2432.27	713.25	1160.19	157.56
49.00	380.26	16.91	2498-12	715.96	1154.66	157.41
49.10	317.19	45.00	2517.92	716.42	1153.74	157.38

sososososososososososososososososososo	EV.DATE: 31 MAY 1985 Run date:12-aug-85:101	建企业等单位的第四年中央企业企业企业企业企业企业企业企业企业企业企业企业企业企业企业企业企业企业企业	NCR. FOR ROT, % =47.20 % = 0.0	Efficiancy data for Wastinghouse induction motor aCONCEPT I: TWIN DRIVE MOTORS by Craig Joseph 10-MAY-85 asassassassassassassassassassassassassa		CKET ach)	0.05	72.44	144.82	217.21	289.59	320.24	326.68	330.17	333.27	336.09	350.71	354.53	357.58
****	REV.DATE: Run date:	**	HASS INCR Grade, t	HOTORS		SPROCKET (hp each)		1	1	21	28	32	32	33	33	33	35	35	35
**************************************	DRIVE PROPOSAL	******************	FICIENT OF DRAG = 1.00 itANCE, 1b/ton = 100.0 in. = 7.63 of FRICTION = 0.70	ACONCEPT I: TWIN DRIVE MOTORS ************************************		SPROCKET (16-ft each)	31147.28	31147.29	31147.28	31147.28	31147.28	27556-31	23920.67	21440.08	19669.78	18320.97	12262.97	9931.20	8644.56
****** ACCELERATION	OPERATOR:R LEWIS Purpose:Electric Dri	***	COEFFICIENT OF DRA ROLLING RESISTANCE, 1b/ton TRACK PITCH, in. = 7.63 COEFFICIENT OF FRICTION =	motor aconcep absequences		SPROCKET (rpm)	0.01	12.21	24.42	36.63	48.83	61.04	11.13	80.88	88.99	96.35	150.20	187.49	217.25
	OPERATOR Purpose	***	80000. ROLLIN Track Coeff	se induction 5 crescestates		DISTANCE (ft)	00.00	0.14	0.43	0.85	1.42	2.13	2.97	3.91	4.95	6.07	20.99	86-04	64.78
***	_	***	45.0	lestinghous 1 10-MAY-8:		SPEED (mph)	0.00	16.0	1.94	2.91	3.88	4.85	5.70	6.42	10.1	7.65	11.93	14.89	17.26
	* W.E. ROOLER R.E.LEWIS	**************************************	GROSS VELCLE WEIGHT, 1bs MAXIMUM VELOCITY, mph = ENGINE NET HP. = 880.0 NUMBER OF SPROCKET TEETH FRONTAL AREA, In. = 68.3	Efficiency data for Westinghouse induction motor by Craig Joseph 10-MAY-85	RESULTS:	NET T.E. (158)	52000.00	51999.84	51999.34	51998.52	51997.38	45539.65	39001.55	34540.13	31355.77	28929.23	18022.87	13816.69	11490.17
****	. F &	BATA INP	GROSS VEHICLE I MAXIMUM VELOCIT ENGINE NET HP NUMBER OF SPROF	Eff1c1er b)	er i	TINE (30C)	0.10	0.20	0.30	0.40	0.50	09.0	0.10	0.80	06.0	1.00	2.00	3.00	4.00

TIME (Sec)	NET T.E. (168)	SPEED (mph)	DISTANCE (ft)	SPROCKET (rpm)	SPROCKET (16-ft each)	SPROCKET (hp each)	
2.00	9897.58	19.26	91.74	242.45	7765.85	358.50	
00-9	8724.48	21.00	121.41	264.38	7120.18	358.42	
1.00	7831.26	22.55	153.48	283.87	6629.92	358.34	
8.00	7121.83	23.94	187.69	301.47	6241.64	358.28	
9.00	6540.77	25-22	223.86	317.55	5924.55	358.22	
10.00	6053.56	26.40	261.81	332,38	5659.47	358.16	
11.00	5637.45	27.49	301.42	346.13	5433.74	356.11	
12.00	5276.73	28.51	342.57	358.97	5238.66	358.06	
13.00	4960.16	29.47	385.17	371.02	5067.96	358.02	
14.00	4679.47	30.37	429.12	382,36	4917.08	357.98	
15.00	4428.41	31.22	474.36	393.07	4782.52	357.94	
16.00	4202.15	32.03	520.80	403.22	4661.63	357.90	
17.00	3996.91	32.79	568.40	412.87	4552.29	357.86	
18.00	3809.66	33.52	617.09	422.05	4452.84	357.83	
19.00	3637.96	34.22	666.82	430.80	4361.92	357.79	
20.00	3479.82	34.88	711.54	439.17	4278.42	357.76	
21.00	3333.56	35.52	769.22	447.19	4201.42	357.73	
22.00	3196.57	36.13	821.81	454.86	4129.46	357.64	

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	TIME (800)	NET T.E. (16s)	SPEED (mph)	DISTANCE (ft)	SPROCKET (rpm)	SPROCKET (1b-ft each)	SPROCKET (hp each)
	23.00	3064.76	36.71	875.27	462.23	4060.29	357.35
	24.00	2941.88	37.27	929.57	469.29	3995.97	357.06
	25.00	2827.00	37.81	984.68	476.07	3936.00	356.78
	26.00	2719.31	38.33	1040.56	482.59	3879.94	356.52
	27.00	2618.14	38.83	1097.18	488.87	3827.40	356.26
	28.00	2522.87	39.31	1154.52	16.464	3778.05	356.02
	29.00	2432.99	39.77	1212.55	500-74	3731.61	355.78
	30.00	2348.04	40.22	1271.24	506.36	3687.83	355.55
В-	31.00	2267.60	40.65	1330.58	511.78	3646.47	355.33
-30	32.00	2191.31	41.07	1390.54	517.02	3607.34	355.12
	33.00	2116.86	41.47	1451.09	522.09	3570.27	354.91
	34.00	2049.95	41.86	1512.23	\$26.99	3535.09	354.71
	35.00	1984.32	42.23	1573.92	531.73	3501.66	354.52
	36.00	1921.75	42.60	1636.16	536.32	3469.86	354.33
	37.00	1862.02	42.95	1698.93	540.17	3439.57	354.15
	38.00	1804.94	43.29	1762.20	545.08	3410.69	353.98
	39.00	1750.34	43.63	1825.97	549.26	3383.12	353.81
	00.04	1698.06	43.95	1890.21	553.31	3356.78	353.65

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TINE (sec)	NET T.E.	SPEED (mph)	DISTANCE (ft)	SPROCKET (rpm)	SPROCKET (1b-ft each)	SPROCKET (hp each)
41.00	1647.96	44.26	1954.92	557.24	3331.59	353.49
42.00	1599.90	44.56	2020-08	561.06	3307.47	353,33
43.00	1553.77	44.86	2085.68	564.17	3284,37	353.18
43.40	1531.66	45.00	2125.24	566.56	3273.32	353.11

essertessectertestestestestestestestestestestestestest	LER OPERATOR:R LEWIS S PUYPOSE:ELECTRIC DRIVE PROPOSAL RUN DATE:12-AUG-85:102	***************************************		HT, 1bs = 80060.  MDh = 45.0  ROLLING RESISTANCE, 1b/ton = 100.0  GRADE, \$\frac{x}{x}\$ = 47.20  TRACK PITCH, in. = 7.63  TEETH = 11  CDEFFICIENT OF FRICTION = 0.70	ta for Mestinghouse induction motor aCONCEPT II: PROPULSION/STEER MOTOR g Joseph 10-MaY-85 :esestriasossossossossossossassassassassassassas		SPEED DISTANCE SPROCKET SPROCKET (aph) (1t) (1pm) (lb-ft each) (hp each)	0.00 0.00 0.01 31147.28 0.05	0.97 0.14 12.21 31147.28 72.44	1.94 0.43 24.42 31147.28 144.82	2.91 0.85 36.63 31147.28 217.21	3.88 1.42 48.83 31147.28 289.59	4.85 2.13 61.04 26704.05 310.34	5.67 2.96 71.37 23287.90 316.44	6.37 3.90 80.25 20924.05 319.73	7.00 4.93 88.14 19225.38 322.65	7.57 6.04 95.32 17925.43 325.32	11.75 20.75 147.96 12056.38 339.64	
**************************************		*****************		45.0 ROLLING 45.0 TRACK PI = 11 COEFFIC	estinghouse induction mo 10-MAY-85 psessossesses														
*****	BY: W.E. RODLER R.E.LEWIS	***************	DATA INPUT:	GROSS VEHICLE WEIGHT, Ibs MAKINUM VELOCITY, Mph = ' ENGINE NET HP. = 880.0 NUMBER OF SPROCKET TEETH : FRONTAL AREA, in. = 68.3	Efficiency data for M by Craig Joseph ************************************	RESULTS:	TIME NET T.E. (sec) (lbs)	0.10 52000.00	0.20 51999.84	0.30 51999.34	0.40 51998.52	0.50 51997.38	0.60 44007.37	0.70 37863.94	0.80 33612.46	0.90 30556.95	1.00 28218.30	2.00 17652.18	*******

10         9703.37         18.93         90.34         238.31         7656.62           0         8550.02         20.64         119.50         259.81         7021.68           0         7671.83         22.15         151.01         278.90         6539.54           0         6403.17         24.77         220.14         311.89         5845.84           0         6403.17         24.77         220.14         311.89         5845.84           0         6403.17         24.77         220.14         311.89         5845.84           0         6403.17         24.77         220.14         311.89         5845.84           0         5924.27         25.93         257.42         326.40         5845.84           0         5160.80         27.99         296.31         339.86         5865.15           1         5160.80         27.99         336.72         352.43         5171.32           4849.74         28.93         378.53         364.20         5033.48           4557.33         30.64         466.07         385.76         4055.11           4105.09         31.43         511.65         395.68         405.47           3179.66	TINE (sec)	NET T.E. (168)	SPEED (mph)	DISTANCE (ft)	SPRUCKET (rom)	SPRUCKET (1b-ft each)	SPROCKET
0 8550.02 20.64 119.50 259.81 7021.68  1671.83 22.15 151.01 276.90 6539.54  0 6403.17 24.77 220.14 311.89 5845.84  0 5924.27 25.93 257.42 326.40 5585.15  1 5160.80 27.99 296.31 339.86 5363.17  1 5160.80 27.99 336.72 352.43 5171.32  1 4849.74 28.93 378.53 364.20 5003.49  4 4573.96 29.81 421.68 375.29 4855.11  4 405.09 31.43 511.65 395.68 4603.95  3 903.53 32.18 558.35 405.10 4496.47 31  3 3552.30 34.84 755.36 430.78 4227.24 34  3 3252.30 34.84 755.36 430.70 4481.55  3 3139.08 35.43 806.93 446.09 4081.57	2.00	9703.37	18.93	90.34	238.31	7656.62	
0         7671.83         22.15         151.01         278.90         6539.54           0         6974.38         23.52         184.62         296.15         6157.68           0         6403.17         24.77         220.14         311.89         5845.84           0         5924.27         25.93         257.42         326.40         5845.84           0         5924.27         25.93         257.42         326.40         5845.15           0         5924.27         26.93         296.31         339.86         5865.15           1         5160.80         27.99         296.31         339.86         5865.15           1         5489.74         28.93         376.20         5003.48         367.17           1         4849.74         28.93         375.29         4855.11         375.29           4573.96         29.81         421.68         375.29         4855.11         375.29           4105.09         31.43         511.65         395.68         4603.95         335.16           3903.53         32.18         558.35         405.10         4496.47         3351.09           3957.60         34.20         430.78         4227.24         33	00-9	8550.02	20.64	119.50	259.81		nd •
64974.38 23.52 184.62 296.15 6157.68 6157.68 6403.17 24.77 220.14 311.89 5845.84 5845.84 5524.27 220.14 311.89 5845.84 5845.84 5524.27 25.93 257.42 326.40 5585.15 5585.15 3560.80 27.99 296.31 339.86 5363.17 32 4849.74 28.93 376.72 352.43 5171.32 364.20 5003.48 375.29 4855.11 33 449.74 28.93 376.72 355.43 517.32 4573.96 29.81 421.68 375.29 4855.11 33903.53 32.18 558.35 405.10 4496.47 33511.09 33.57 654.91 422.61 4309.32 33511.09 33.57 654.91 422.61 4309.32 33552.30 34.84 755.36 438.60 4151.56 33119.08 35.43 806.93 446.09 406.15	7.00	7671.83	22.15	151.01	20 94 6	1041.68	347.35
6403.17     24.77     220.14     311.89     5845.84       9224.27     220.14     311.89     5845.84       5515.30     26.99     296.31     339.86     5363.17       5160.80     27.99     336.72     352.43     5171.32       4849.74     28.93     378.53     364.20     5003.48       4849.74     28.93     378.53     364.20     5003.48       4573.96     29.81     421.68     375.29     4855.11       4327.33     30.64     466.07     385.76     4722.82       4105.09     31.43     511.65     395.68     4603.95       3903.53     32.18     558.35     405.10     4496.47       3751.09     33.57     654.91     422.61     4309.32       3395.85     34.84     755.36     438.60     4151.56       319.08     35.43     606.12     414.06     4398.70       3352.30     34.84     755.36     438.60     4151.55       3119.08     35.43     606.93     446.09     4151.55	8.00	86.4469	23 63		06.817	6539.54	347.28
6403.17     24.77     220.14     311.89     5845.84       6403.17     25.93     257.42     326.40     5585.15       1     5515.30     26.99     296.31     339.86     5363.17       1     5160.80     27.99     336.72     352.43     5171.32       1     4849.74     28.93     378.53     364.20     5003.48       1     4849.74     28.93     378.52     4855.11     364.20       1     4573.96     29.81     421.68     375.29     4855.11     364.20       1     4327.33     30.64     466.07     385.76     4722.82     366.47       2     4105.09     31.43     511.65     395.68     4603.95     366.47       3     3793.53     32.18     558.35     405.10     4496.47     366.47       3     375.09     33.57     654.91     422.61     4309.32     366.41       3     355.00     34.84     755.36     430.78     4227.24     376.57       3     355.30     35.43     606.93     446.09     4151.55     376.57			76.67	184.62	296.15	6157.68	347.22
0     5924-27     25.93     257.42     326.40     5585.15       0     5515.30     26.99     296.31     339.86     5363.17       1     5160.80     27.99     336.72     352.43     5171.32       4849.74     28.93     378.53     364.20     5003.48       4573.96     29.81     421.68     375.29     4855.11       4327.33     30.64     466.07     385.76     4722.82       4105.09     31.43     511.65     395.68     4603.95       3903.53     32.18     558.35     405.10     4496.47     3       3551.09     33.57     654.91     422.61     4309.32     3       3355.30     34.84     755.36     438.60     4151.55     3       3119.08     35.43     806.93     446.09     4051.57     3	00.6	6403.17	24.17	220.14	311.89	5845.84	34.3 44
5515.30     26.99     296.31     339.86     5363.17       5160.80     27.99     336.72     352.43     5171.32       4849.74     28.93     378.53     364.20     5003.48       4573.96     29.81     421.68     375.29     4855.11       4327.33     30.64     466.07     385.76     4722.82       4105.09     31.43     511.65     395.68     4603.95       3903.53     32.18     558.35     405.10     4496.47       3719.66     32.89     605.12     414.06     4398.70       3551.09     33.57     654.91     422.61     430.32       3395.85     34.84     755.36     438.60     4151.56       3119.08     35.43     806.93     446.09     4081.57	0.00	5924.27	25.93	257.42	326.40	55.85.15	91.140
\$160.80     27.99     336.72     352.43     \$171.32       \$4849.74     \$26.93     378.53     364.20     \$003.48       \$4573.96     \$29.81     \$421.68     375.29     \$4855.11       \$4327.33     \$30.64     \$466.07     \$385.76     \$722.82       \$4105.09     \$31.43     \$511.65     \$395.68     \$4603.95       \$3903.53     \$32.18     \$58.35     \$405.10     \$496.47       \$3719.66     \$32.89     \$605.12     \$414.06     \$4309.32       \$3551.09     \$33.57     \$654.91     \$422.61     \$4309.32       \$3395.85     \$34.84     \$755.36     \$438.60     \$4151.56       \$3119.08     \$35.43     \$806.93     \$46.09     \$4081.57	11.00	5515.30	26.99	296.31	339.86	616363	347.11
4849.74     20.93     378.53     364.20     5003.48       4573.96     29.81     421.68     375.29     4855.11       4327.33     30.64     466.07     385.76     4722.82       4105.09     31.43     511.65     395.68     4603.95       3903.53     32.18     558.35     405.10     4496.47       3719.66     32.89     606.12     414.06     4398.70       3551.09     33.57     654.91     422.61     430.78     4227.24       3395.85     34.84     755.36     438.60     4151.56     3       3119.08     35.43     806.93     446.09     4081.57	2-00	5160.80	27.99	336.72	352.43	5171.32	347.06
4573.96       29.81       421.68       375.29       4855.11         4327.33       30.64       466.07       385.76       4722.82         4105.09       31.43       511.65       395.68       4603.95         3903.53       32.18       558.35       405.10       4496.47         3719.66       32.89       605.12       414.06       4398.70         3551.09       33.57       654.91       422.61       4309.32         3395.85       34.22       704.67       430.78       4227.24         3252.30       34.84       755.36       438.60       4151.56         3119.08       35.43       806.93       446.09       4081.57	3.00	4849.14	28.93	378.53	364.20	5003.40	341.01
4327,33 30.64 466.07 385.76 4722.82 4105.09 31.43 511.65 395.68 4603.95 3903.53 32.18 558.35 405.10 4496.47 3719.66 32.89 605.12 414.06 4398.70 3551.09 33.57 654.91 422.61 4309.32 3395.85 34.22 704.67 430.78 4227.24 3252.30 34.84 755.36 438.60 4151.55 3119.08 35.43 806.93 446.09 4081.57	00-1	4573.96	29.81	421.68	376 30		140.97
4105.09 31.43 511.65 395.68 4603.95 3903.53 32.18 558.35 405.10 4496.47 3719.66 32.89 606.12 414.06 4398.70 3551.09 33.57 654.91 422.61 4309.32 3395.85 34.22 704.67 430.78 4227.24 3252.30 34.84 755.36 438.60 4151.56 3119.08 35.43 806.93 446.09 4081.57	00-	4327.33	30.64	466.03	63.616	4855.11	346.93
3903.53 32.18 558.35 405.10 4496.47 3719.66 32.89 606.12 414.06 4398.70 3551.09 33.57 654.91 422.61 4309.32 3395.85 34.22 704.67 430.78 4227.24 3252.30 34.84 755.36 438.60 4151.55	5				385.76	4722.82	346.89
3903.53 32.18 558.35 405.10 4496.47 3719.66 32.89 606.12 414.06 4398.70 3551.09 33.57 654.91 422.61 4309.32 3395.85 34.22 704.67 430.78 4227.24 3252.30 34.84 755.36 438.60 4151.56 3119.08 35.43 806.93 446.09 4081.57		4105.09	31.43	511.65	395.68	4603.95	346.84
351.09 33.57 654.91 422.61 4309.32 3395.85 34.22 704.67 430.78 4227.24 3252.30 34.84 755.36 438.60 4151.56 3119.08 35.43 806.93 446.09 4081.57	00.	3903.53	32.18	558.35	405.10	4496-47	
3395.09 33.57 654.91 422.61 4309.32 3395.85 34.22 704.67 430.78 4227.24 3252.30 34.84 755.36 438.60 4151.56 3119.08 35.43 806.93 446.09 4081.57	00.	3719.66	32.89	605.12	414.06	4300 1	78 °9 °C
3395.85 34.22 704.67 430.78 4227.24 3252.30 34.84 755.36 438.60 4151.56 3119.08 35.43 806.93 446.09 4081.52	.00	3551.09	33.57	654.91	422.61	4809	346.79
3252.30 34.84 755.36 438.60 4151.56 3119.08 35.43 806.93 446.09 4081.52	• 00	3395.85	34.22	104.67	430.78	4227.24	940.16
3119.08 35.43 806.93 446.09 4081.52	00.	3252.30	34.84	755.36	438.60	4151.56	346.70
	00.		35.43	806.93	446.09	4081.52	

TIME (sec)	NET T.E. (16s)	SPEED (mph)	DISTANCE (ft)	SPROCKET (rom)	SPROCKET (16-ft each)	SPRUCKET (hp each)
23.00	2995.01	36.00	859.36	453.28	4016.48	346.65
24.00	2874.20	36.55	912.61	460.18	3953.14	346.37
25.00	2761.28	37.08	966.65	466.81	3894.10	346.11
26.00	2655.45	37.58	1021.44	413.17	3838.90	345.86
27.00	2556.04	38.07	1076.95	479.30	3787.19	345.62
28.00	2462.46	38.54	1133.17	485.20	3738.62	345.39
29.00	2374.19	38.99	1190.06	490.89	3692.92	345.16
30.00	2290.11	39.43	1247.59	496.37	3649.84	344.95
31.00	2211.79	39.85	1305.76	501.66	3609.15	344.74
32.00	2136.91	40.25	1364.53	506.77	3570.66	344.54
33.00	2065.81	+9.0+	1423.88	511.71	3534.19	364.34
34.00	1998.20	41.02	1483.80	516.49	3499.59	344.16
35.00	1933.82	41.39	1544.27	521.11	3466.72	343.97
36.00	1872.44	41.75	1605.26	525.59	3435.46	343.80
37.00	1813.87	42.09	1666.77	529.92	3405.68	343.63
38.00	1757.91	42.42	1728.77	534-12	3377.29	343.46
39.00	1704.38	42.75	1791.25	538.19	3350.19	343.30
40.00	1653.14	43.06	1854.20	542.13	3324,30	343.0

TIME (Sec)	NET T.E. (lbs)	SPEED (mph)	DISTANCE (ft)	SPROCKET (rpm)	SPROCKET (1b-ft each)	SPROCKET (hp each)
41.00	1604.04	43.36	1917.60	545.96	3299.54	343.00
42.00	1556.96	43.66	1981.44	549.68	3275.85	342.85
43.00	1511.77	43.95	2045.71	553.28	3253.15	342.71
44.00	1468.36	44.22	2110.38	556.78	3231.39	342.57
45.00	1426.64	64.49	2175.47	560.19	3210.51	342.44
46.00	1386.50	44.76	2240.94	563.49	3190.46	342.31
06.94	1349.65	45.00	2313-39	566.56	3172.08	342.19

MASS INCR. FOR ROT, \$ =24.60 GRADE, \$ = 0.0 REV. DATE: 31 MAY 1985 RUN DATE:12-AUG-85:100 COEFFICIENT OF DRAG = 1.00
ROLLING RESISTANCE, 1b/ton = 100.0
TRACK PITCH, in. = 7.63
COEFFICIENT OF FRICTION = 0.70 VEHICLE ACCELERATION CHARACTERISTICS OPERATOR: R LEWIS PURPOSE: ELECTRIC ORIVE PROPOSAL GROSS VEMICLE WEIGHT, 1bs = 80000.
MAXIMUM VELOCITY, mbh = 45.0
ENGINE NET MP. = 890.0
FRONTAL AREA, 1n. = 68.3 BY: W.E. RODLER R.E.LEWIS DATA INPUT: RESULTS:

SPROCKET (hp each)	0.0	64.74	150.25	235.77	301.97	308.97	313.64	317.68	321.29	324.59	336.02	339.49	341.35
SPROCKET (16-ft each)	24103.19	31147.28	31147.28	31147.28	29274.51	23983.62	20982.47	18990.77	17538.72	16416.34	11047.05	8984.16	7821.99
SPROCKET (rpm)	0.01	10.92	25.34	39.76	54.17	67.66	78.51	87.86	96.21	103.84	159.75	198.46	229.19
DISTANCE (ft)	0.00	0.13	0.42	0.89	1.52	2.30	3.22	4.24	5.36	6.57	22.52	43.71	68.85
SPEED (mph)	00.0	18.0	2.01	3.16	4.30	5.37	6.24	86.9	1.64	8.25	12.69	15.76	18.20
NET T.E. (16s)	39335.36	51999.87	51999.29	51998.26	48629.70	39115.36	33717.80	30135-19	27522.85	25503,21	15833.50	12109.34	10005.39
TIME (sec)	0.10	0.20	0.30	0.40	0.50	09.0	0.70	0.80	0.00	1.00	2.00	3.00	00.4

TIME (50C)	NET T.E. (16s)	SPEED (mph)	DISTANCE (+t)	SPRUCKET (rpm)	SPROCKET (1b-ft each)	SPROCKET (hp each)
5.00	8565.49	20.26	97.25	255.02	7028.78	341.30
00.9	7529.85	22.03	128.42	277.41	6460.05	341.22
7.00	6136.09	23.61	162.03	297.26	6025.55	341.04
8.00	6103.65	25.03	197.82	315.12	5680.48	340.83
9.00	5583.48	26.32	235.58	331.37	5397.60	340.56
10.00	5146.07	27.51	275.15	346.29	5160.50	340.26
11.00	41711.14	28.60	316.39	360.08	4957.93	339.92
12.00	4446.47	29.62	359.16	372.90	4783.11	339.61
13.00	4141.17	30.57	403.38	384.86	4629.97	339.28
14.00	3907.59	31.46	46.874	396.08	4494.30	338.94
15.00	3673.79	32.30	495.76	406.62	4369.44	338.29
16.00	3463.53	33.08	543.77	416.54	4257.49	337.66
17.00	3273.49	33.83	592.90	425.90	4156.62	337.07
18.00	3100.72	34.53	643.08	434.76	4065.20	336.52
19.00	2941.89	35.20	694.27	443.16	3981.37	335.94
20.00	2795.65	35.83	146.41	451.13	3904.40	335.37
21.00	2659.13	36.43	799.45	458.71	3832.69	334.75
22.00	2532,35	37.01	853.36	465.92	3766.26	334.12

TIME (sec)	NET T.E. (1bs)	SPEED (mph)	DISTANCE (ft)	SPROCKET (rpm)	SPROCKET (1b-ft each)	SPROCKET (hp each)
23.00	2414.85	37.55	908.08	472.79	3704.86	333.52
24.00	2305.60	38.07	963.58	419.35	3647.92	332.95
25.00	2208-23	38.57	1019.82	485.62	3597.47	332.64
26.00	2111.44	39.05	1076.78	491.62	3547.23	332.04
27.00	2020-83	39.50	1134.42	497.36	3500.31	331.48
28.00	1935.83	39.94	1192.71	502.86	3456.39	330.94
29.00	1855.92	40.36	1251.63	508.13	3415.21	330.42
30.00	1780-18	40.76	1311.15	513.18	3376.24	329.90
31.00	1708.51	41.15	1371.25	518.02	3339.44	329.38
32.00	1640.82	41.51	1431.89	522.68	3304.76	328.89
33.00	1576.79	41.87	1493.07	527.15	3272.02	328.41
34.00	1516.15	42.21	1554.75	531.64	3241.07	327.96
35.00	1458.63	42.54	1616.93	535.57	3211.78	327.52
36.00	1404.02	42.85	1679.58	539.55	3184.02	327.10
37.00	1352.10	43.16	1742.68	543,38	3157.69	326.70
36.00	1302.69	43.45	1806.22	547.06	3132.67	326.31
39.00	1255.62	43.73	1870.17	550.62	3108.88	325.93
00-04	1210.75	44.01	1934.54	554.04	3086.24	325.57

IME	NET T.E.	SPEED	DISTANCE	SPROCKET	SPROCKET	SPROCKET
(30C)	(1bs)	(mph)	£	(mdr)	(1b-ft each)	(hp each)
11.00	1167.92	44.27	1999.29	\$57.35	3064.66	325.22
42.00	1 .27.02	44.52	2064.42	560.53	3044.10	324.89
43.00	1087.92	44.77	2129.92	563.61	3024.47	324.57
43.90	1050.80	45.00	2202.37	566.56	3005.86	324.26

## B.2.C Maximum Turn Conditions

The following tables provide drivetrain dat for a vehicle in a turn. These tables are divided into three sections consisting of Title Heading, Data Input and Results. The Title Heading provides in addition to the title, traceability data of program authors, revision data and run date.

The data input section is generally similar to the previous sections except that an input titled "Maximum Acceleration" has been added. This input is the maximum lateral acceleration that the vehicle is to develop in a turn. For this study, a value of 0.5 has been used as representative of aggressive but not reckless driving.

The Results section provides the following data:

- 1. Vehicle speed in 1.5 MPH increments to 45 MPH.
- 2. Lateral acceleration in G's, limited either by available power or by the selected maximum.
- 3. Turn radius in feet measured to the centerline of the vehicle.
- 4. Data for inner and outer sprockets is presented in four columns each as follows:
  - a. Apparent horsepower is the combined power at the sprocket and is the value that would be determined by use of a torque meter and RPM counter.
  - b. Propulsion horsepower is the fraction of the apparent power that is used to propel the vehicle.
  - c. Sprocket RPM with a negative sign indicates reverse rotation.
  - d. Sprocket torque with a negative sign indicates a retarding rather than driving torque.
- 5. Scrub horsepower is the power loss due to scrubbing the tracks around a turn and power flow is always from the vehicle to the tracks.
- 6. Transfer horsepower is the regenerated power that enters the inner sprocket, is transferred by the drive train to the outer sprocket.

	14 MAY 1985	
SPROCKET HORSEPONER	REV.DATE:	
SPROCKET	W.E. ROOLER	L.M. FERNANDEZ
	¥.E.	۲. H.
	8 Y :	

SPROCKET HORSEPON  W.E. RODLER  E.M. FERNANDEZ  RUN DATE: 7-AUG-85:	HORSEPONER Rev.Date: 14 may 1985 -aug-85:2
\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$	
DATA IMPUT:	
CO W THE TRACE OF SEC. IN SEC.	0 0 - 4 - 10 F 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
NUM VELDCIIV. BDP # 45.0 TRACK LENGTH. In. H	COEFFICIENT OF FRICTION :
0.0 TRACK PITCH, in. = 6	MAXINUM ACCELERATION, 98
LOSS ENGINE HP. = 60.0 NUMBER OF SPROCKET TEETH : FRONTAL AREA, in. = 57.0 ROLLING RESISTANCE.1b per	TH = 11 per ton= 100.0 CUEFICIENT OF DRAG = 1.00
	I: THIN PROPULSION MOTORS
RESULTS:	
VEN GENERALY TORN # INTER SYNCINE # DUTEX SPEED # ACCEL #RADIUS#PPARNI# PROP # RPM #IORQUE #APPARNI# P (#Dh) # (#11bs) # (#1 # HP # HP # # (#11bs) # HP #	FR VPROCRET  PROP # RPR #10RQUE # HP # H
0.004 0.0004 0.008 175.314 15.44 -94.14-9783.34 175.374	15.44 94.144 9783.34 160.04 0.0
1.50¢ 0.089¢ 1.69¢ 121.28¢ 10.7¢ -65.8¢-9686.7¢ 209.37¢	18.54113.52* 9686.7# 150.7# 40.1
3.00* 0.071* 8.49* -17.47* 2.0* 12.1*-7591.5* 147.87*	13.64 83.444 9308.14 57.44 76.8
4.50# 0.151# 8.97# -30.20# 3.4# 21.0#-7564.9# 216.19#	20.04122.32# 9283.0# 81.3# 114.9
6.00# 0.256# 9.40# -44.55# 5.1# 31.0#-7540.8# 282.15#	26.2*160.02* 9260.8* 103.2* 152.8
7.50¢ 0.360¢ 10.46¢ -66.93¢ 7.7¢ 47.0¢-7482.0¢ 335.19¢	31.54191.834 9204.74 115.14 189.7
9.00* 0.434* 12.47* -98.82* 11.6* 70.4*-7372.9* 374.50*	35.5#216.17# 9098.8# 114.3# 224.7
10.50* 0.500* 14.75*-131.49* 15.7* 95.2*-7251.1* 408.83*	39.4#239.09# 8980.7# 111.1# 258.3
12.00# 0.500# 19.26#-171.14# 21.1# 128.1#-7016.1# 423.13#	41.9#253.98# 8750.1# 94.5# 286.7
13.50* 0.500* 24.38*-204.56* 26.3* 159.0*-6757.8* 438.20*	64.8#270.87# 8496.7# 81.2# 312.1
15.00* 0.500* 30.10*-232.48\$ 31.3* 188.5*-6479.0* 452.73*	48.0+289.15# 8223.3# 70.5# 334.Z
16.50# 0.500# 36.42#-255.34# 36.1# 216.9#-6182.4# 465.89#	51.44308.464 7932.74 61.54 353.0
18.00# 0.500# 43.34#-273.43# 40.9# 244.6#-5870.9# 477.14#	55.04328.524 7628.04 53.94 368.3
19,50# 0.500# 50.86#-287.01# 45.6# 271.7#-5547.7# 486.12#	58.64349.18# 7311.9# 47.4# 380.1

SPROCKE	SPROCKET HORSEPOWER RU	N DATE:N	RUN DATE:No. 7-AUG-85:2				
VEH 41 SPEED 4 (mph) 4	eLATERAL# TURN # I c ACCEL #RADIUS#APPARNT# c (gs) * (ft) # HP c	INNER SP	SPROCKET & CU * RPM *TORQUE &APPARNT * *(fllbs)* HP *	OUT APPARNT# HP #	OUTER SPROCKET # T# PROP # RPM #TORQUE # # HP # : #(flbs)#	SCRUB #1	ATRANSFRA A IP A
21.00*	0.500* 58.99*-296.29*	50.34	50.3# 298.4#-5215.6# 492.65#	492.65	62.54370.29# 6987.6#	41.8*	388.4
22.50*	0.500# 67.72#-301.49#	55.0	55.0# 324.6#-4877.5# 496.63#	469.63#	66.4#391.77# 6657.8#	36.9	393.4
24.00*	0.500# 77.05#-302.83#	59.7*	59.7# 350.6#-4536.2# 498.08#	498.08*	70.4*413.56* 6325.6*	32.5	395.1
25.50*	0.500# 86.98#-300.57#	64.5#	64.5# 376.4#-4194.5# 497.07#	497.07	74.64435.59# 5993.4#	28.7*	393.7
27.00	0.500# 97.51#-294.97#	69.2	69.2# 401.9#-3855.0# 493.72#	493.72#	78.8*457.82# 5663.9#	25.3#	389.5
29.50	0.500#108.65#-286.32#	14.0*	74.0# 427.2#-3519.9# 488.22#	488.22#	83.24480.234 5339.54	22.3*	382.7
30.00*	0.500#120.38#-274.92#	78.94	78.9# 452.4#-3191.3# 480.78#	480.18*	87.64502.794 5022.24	19.7*	373.5
31.50*	0.500#132.72#-261.06#	83.8*	83.8# 477.5#-2871.3# 471.63#	471.63*	92.2#525.47# 4714.0#	17.3*	362.1
33.00*	0.500#145.66#-245.06#	88.7*	88.7# 502.5#-2561.4# 461.04#	461.04*	96.8*548.26* 4416.6*	15.24	349.0
34.50	0.500#159.21#-227.25#	93.8*	93.8# 527.4#-2263.2# 449.26#	449.26#	101.64571.144 4131.34	13.34	334.4
36.00*	0.500*173.354-207.91*	98.9*	98.94 552.24-1977.74 436.574	436.57#	106.4*594.11# 3859.3#	11.7*	318.5
37.50	0.500#188.10#-187.37#	104.1*	104.1# 576.9#-1705.9# 423.22#	423.22*	111.44617.154 3601.74	10.2*	301.7
39.00	0.500#203.45#-165.89#	109.4	109.44 601.54-1448.44 409.47#	*19.60*	116.5#640.26# 3358.9#	8.9	284.2
40.50	0.500#219.40#-143.75#	114.8*	114.8# 626.1#-1205.8# 395.58#	395.58	121.64663.424 3131.64	1.7*	266.2
45.00	0.500*235.95*-121.20*	120.3*	120.3* 650.7* -978.3* 381.75*	301.754	126.9*686.64# 2920.0#	6.7*	248.2
43.50	0.500#253.11# -98.47#	125.9*	125.9* 675.2* -766.0* 368.20*	368.20*	132.34709.90# 2724.1#	5.84	230.1
42.00*	0.500#270.86# -75.75#	131.6#	131.64 699.64 -568.74 355.124	355.12#	137.94733.20# 2543.8#	5.04	212.3
******* End	petetetetetetetetetetetetetetetetetetet	******	******	**	*****************	****	*****

SPROCKET HORSEPOWER  67: M.E. ROOLER  R.F. LEWIS  RUN DATE: 7-AUG-05;3	自由的最后的自由的自由的自由的自由的自由的自由的自由的自由的自由的自由的自由的自由的自由的		Efficiency data for Westinghouse induction motor & CONFIGURATION II by Craig Joseph 10-MAY-85 & PROPULSION/STEER MOTOR SET-UP	RESULTS:	VEH, # LAT.# TURN # INNER SPROCKET # CUTER SPROCKET # STEER WOTOR # PROPULSION MOTOR #SCRUB#TRANS SPEED #ACCEL#RADIUS #APARNTAPROP # RPH #TORQUE # HP # RPH #TORQUE # HP # RPH #TORQUE # HP # HP # HP # HP # HP # RPH #TORQUE # HP # RPH # TORQUE # HP # #Clbft)# # # # #Clbft)# # # #Clbft)# # # #Clbft)# # # #Clbft)# # # # #Clbft)# # # # # #Clbft)# # # # #Clbft)# # # # #Clbft)# # # # # #Clbft)# # # # # # # #Clbft)# # # # # # # # # # # # # # # # # # #	$\phi_{\phi_{\phi_{\phi_{\phi_{\phi_{\phi_{\phi_{\phi_{\phi_{\phi_{\phi_{\phi_{\phi$	1.50 p.0740# 2.03# 93.2# 8.3#-50.7#-9667.3# 177.9# 16.1# 98.4# 9496.2# 295.6# 7423.7# 209.1# -0.8# 503.6# -8.6#125.0# 40.1	7473.5# 205.6#	\$4.2240\$ 6.06\$ 6.6\$ 6.4\$ 0.6\$ -3.6\$-9443.5\$ 254.7\$ 24.0\$146.8\$ 9108.4\$ 288.7\$ 7490.1\$ 202.5\$ -4.9\$ 1510.9\$ -	6.00 #.2990# 8.05# -29.3# 3.3# 20.2#-7614.0# 291.2# 28.0#170.8# 8955.0# 258.2# 7498.4# 180.8# 25.9# 2014.6# 67.6#121.5#154.1 # # # # # # # # # # # # # # # # # # #	* * * * * * * * * * * * * * * * * * *	10.50 # 5 # 5 # 5 # 5 # 5 # 5 # 5 # 5 # 5 #	19.264-171.14 21.14128.14-7016.34 400.24 41.94254.04 8275.94 199.24 6269.54 166.94 48.74 4029.1	13.50 * 50.00 24.37*-204.6 26.34159.0*-6758.1 413.3 44.84270.9 * 8012.8 4111.0 * 5572.9 * 161.2 * 54.6 * 4532.8 * 63.3 * 81.3 * 312.1	30.094-232.5¢ 31.3¢188.4¢-6479.3¢ 426.0¢ 48.0	16.50 #.5000 # # # # # # # # # # # # # # # # # #	43.334-273.4# 40.9	50.854-287.04 45.6
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	MOTOR #SCRUBETRANS # *TORQUE# HP # HP #(16ft)# #	, 1985年,	68.54 36.94393.4	70.04 32.54395.1	71.64 26.74393.8	73.24 25.4#389.6	74.94 22.44382.7	76.6* 19.7*373.5	78.3# 17.3#362.2	# # 80.1* 15.2*349.1	# # 81.8# 13.3#334.4	83.6* 11.7*318.6	85.3# 10.2#301.7	87.0* 8.9*294.2	# # 88.6# 7.7#266.3	6.7*248.2	5.8#230.2	93.54 5.04212.4	
	R #S( DRQUE#   1bft)#	67.24	68.54	10.04	71.64	73.24	74.94	76.6# 1	78.3# 1	80.1# 1	81.94	83.6# 1	85.3# 1	87.0*	88.6*	90.3#	91.9*	93.5	¥
	PROPULSION MOTOR HP # TO	7051.04	7554.64	\$0.58.3 <b>\$</b>	8561.9#	*9.5906	9569.2#	0072.8*	1576.5	1080.1*	*8*E851	2087.4	2591.04	* 3094.7*	*E*8658	1102.0	*9.5091	\$109.3*	*
	PROPULS HP #	90.2#	49-86	107.4*	116.7	126.48	136.54	86.2* 146.9*10072.8*	19.6* 157.8*10576.5*	* * * 73.2* 168.9*11080.1*	* * * * 67.161583.89	61.3# 192.3#12087.4	55.7# 204.4#12591.0#	\$0.4* 216.8*13094.7*	*E*84 529 *5*13598*3	40.9# 242.4#14102.0#	255.6#14	32.74 269.0415109.34	•
	*TORQUE *TORQUE *(16ft)*	128.4	121.3#	114.2*	107.1#	100.04	93.04	86.2*	19-61	73.2*	67.1	61.3*	55.7*	20.4	45.5*	40-9#	36.6#	32.74	*
	STEER MOTOR # RPM #T	######################################	77.24 3343.74 121.34 98.64 7554.64	68.1# 3134.7¢ 114.2# 107.4# 8058.3¢	60.1	2786.4#	46.8# 2639.8# 93.0# 136.5# 9569.2#	41.2# 2507.8#	36.24 2388.44	* * 31.8* 2279.8*	* * * 27.9* 2180.7#	24.4# 2089.8#	21.3# 2006.2#	18.54 1929.14	16.14 1857.64	13.9# 1791.3#	12.14 1729.54	10.4# 1671.9#	•
	STE ##	####### #9°/8	77.2*	68.1#	60.1#	53.1*	46.84	41.2*	36.2*	31.8#	27.9#	24.4	21.3	18.54	16.1	13.9*	12.16	10.4	*
	.er   #TORQUE #   #(15ft) #	6547.3#	6236.4	5924.6*	5614.18	5307.0#	5005.3#	4710.7*	4425.18	4149.7	3885.9#	3634.7*	3396.9*	3173.0	2963.6#	2768.74	2588.54	2422.7#	•
	PROCKET # RPM #1	4370.34 *	*391.8*	*413.6*	#435.6#	18457.88	*480.2	*502.8	*525.5	* * *	# #571.1#	#594.1#	*617.2*	*640-3*	*663.4*	*9.989	*709.9*	#733.2# #	•
	ROCKET & OUTER SPROCKET RPM STORQUE SAPARNISPROP & RPM STORQUE R *(1611) & HP & HP & *(1611)	**************************************	#324.64-6878.04 465.24 66.44391.84 6236.44	#350.6#-4536.8# 466.5# 70.4#413.6# 5924.6#	#376.3#-4195.1# 465.6# 74.6#435.6# 5614.1#	#401.94-3855.64 462.64 78.84457.84 5307.04	#427.2#-3520.5# 457.7# 83.2#480.2# 5005.3#	4452.44-3192.04 451.04 87.64502.84 4710.74	#477.54-2872.0# 442.7# 92.2#525.5# 4425.1#	# # # # # # # # # # # # # # # # # # #	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	4552.24-1978.34 411.24106.44594.14 3634.74	.2*111.4	# 0.51.5 #5.043#5.011#8.386.#0.94#1-#2.103#		#650.74 -978.94 362.04126.94686.64 2768.74	.9*132.3	.2*137.9	
UG-85:3	T * *TORQUE *APAR *(16ft) * HP	6.0# 46.	8.0* 465	6.8* 466	5.1# 465	5.6* 462	0.5# 457	2.0# 451	2.0* 442	2.1# 433	3.8* 422 *	8.3* 411	6.5* 399	9.0* 386	6.4# 374	8.9* 362	6.5# 349	9.2# 338	•
ATE:No. 7-AUG-85:3	CKET PM #TORQ #Clbf	3.4#-521	1.64-487	). 6#-453 #	6-3#-419 #	1.94-385	7.24-352	2.4#-319 #	1-54-287	.54-256	# '• <b>4</b> #-226	1-24-197	94-170	.5*-144	14-120	1.74 -97	-2# -76	*6* -56	•
RUN DATE					64.5#37	69.2*40	74-0#42	78.9#45.		88.7*50.	-			•	14.8#624	20.3*650	25-9#67	31.6#699	•
_	APARN HP	58.98*-296.3* 50.	67.70*-301.5* 55.0	77.03#-302.9# 59.7	86.96#-300.6# 64.5	97.494-295.04 69.2	28.50 *.5000* 108.62*-286.4* 74.0	30.00 4.5000* 120.364-275.0* 78.9	31.50 4.5000# 132.704-261.1# 83.0	33.00 4.50004 145.634-245.14 88.7	34.50 #.5000# 159.18#-227.3# 93.0	36.00 \$.5000\$ 173.32\$-208.0\$ 98.9	37.50 4.50004 188.064-187.44104.1	39.00 #.5000# 203.41#-166.0#109.	40.50 %.5000% 219.35%-143.8%114.8%626.1%-1206.4% 374.4%121.6%663.4% 2963.6% % % % % % % % % % % % % % % % % % %	42.00 *.5000* 235.90*-121.3#120.3	43.50 #.5000# 253.06# -98.5#125.9#675.2# -766.5# 349.9#132.3#709.9# 2588.5#	45.00 4.50004 270.814 -75.84131.64699.64 -569.24 338.24137.94733.24 2422.74	•
Pr JER	TURN #	58.98					108.62*	120.36#	132.70*	145.63	159.184	173.32#	188.06	203.41*	219.354	235.90#	253.06#	270.81#	•
PROCKET HORSEPFJER	# LAT.# TURN #ACCEL#?ADIU: # (95)# (ft)	21.00 #.5000#	** \$000*	** 5000*	25.50 4.5000#	27.00 *.5000*	* 5000*	* 5000*	** 5000*	*-5000	*.5000*	** 5000*	*.5000*	*.5000*	*.5000*	** 5000*	** 5000*	* 5000*	
PROCKE	VEH. SPEED (mph)	21.00	22.50	24.00	25.50	27.00	28.50	30.00	31.50	33.00	34.50	36.00	37.50	39.00	40.50	42.00	43.50	45.00	

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HORSEPOWER Rev.date:
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SPRO( E. RODLER M. FERNANDE?
SPROC W.E. RODLER L.M. FERNANDEZ
SPROC 7: W.E. RODLER L.M. FERNANDE?
SPROCKET HORSEPOWER BY: W.E. RODLER L.M. FERNANDEZ
SPROC BY: W.E. RODLER L.M. FERNANDE:
SPROG 87: W.E. RODLER L.M. FERNANDE?
SPROG BY: W.E. RODLER L.M. FERNANDE?

		在全部的 医克勒氏试验检检验检验检验检验检验检验检验检验检验检验检验检验检验检验检验检验检验检验		GRADE, \$ = 0.0 COEFFICIENT OF FRICTION = 0.70 MAXIMUM ACCELERATION, 98 =0.50 COEFICIENT OF DRAG = 1.00	**************************************		# # # ex u.	0.0	40.1	16.8	•		6.	<b>.</b>			7	7.	0.	e.	.1
		***		FRICTI RATION DRAG =			#TRANSFR# # HP #	•	3	16	114.8	152.7	188.9	223.3	255.8	286.7	312.1	334.2	353.0	368.3	380.1
		*******		ENT OF FI ACCELERA! NT OF DR			SCRUB #T	151.0#	142.6#	56.5#	80.2*	102.0#	108.4#	105.3*	99.8*	94.54	81.2#	70.54	61.5*	53.9*	41.4#
1985		***		GRADE, % = 0. COEFFICIENT OF MAXIMUM ACCELE COEFICIENT OF	CORRESPONDENCE CONTRACTOR CONTRAC		* *TORQUE * *(ftlbs)*	9783.3*	17.84108.794 9681.44	9301.34	19.94121.67# 9276.7#	9255.24	30.84187.884 9172.34	9047.1*	8901.74	8750.1*	8496.7*	8223.3*	51.44308.464 7932.74	7628.0	58.64349.184 7311.9#
HAY 1		*			# RD 18			88.88	194		<b>67</b>		# 80	88	38#	#86	87*	15#	*94	.52#	18*
*		**		100-0	****		SPROCKET P # RPM		108.	82.	.121.	159.	187.	£210.	1232.	1253.	.270.	.289.	308	1328.	1349.
		* * * * * * * * * * * * * * * * * * * *		ton#	* 2 *		R SPROP #	14.5*	17.84	13.5# 82.91#	19.94	26.1#159.31#	80.8	34.6#210.88#	38.3#232.38#	41.9#253.98#	44.8#270.87#	48.0#289.15#	51.44	55.0#328.52#	58.61
POWE	8558	***		92.5 150.0 .03 EETH #			<u> </u>	_	_		_		•••	***	•••				-		•
HORSEPOWER Rev.date:	7-AUG-85:1	***		TREAD WIDTH, in. = 92.5 TRACK LENGTH, in. = 150.0 TRACK PITCH, in. = 6.03 NUMBER OF SPROCKET TEETH = ROLLING RESISTANCE, 1b per	:		z	165.564	200.54*	. 8 4	214.90*	280.73*	328.12*	.26#	.85#	423.13*	438.20#	452.73#	468.89*	477-14#	.12
		* * *		in. in. fn. STANC	**************************************		APPAG			146		280	328	363	393						486
SPROCKET Er Andez	DATE:	**		MIDTH, in. # LENGTH, in. # PITCH, in. # PITCH, in. # R OF SPROCKET	* 0 *		* *TORQUE *. *(ftlbs)*	3.3*	1.4	*1.5	8.6	15.1	9.7	1.2*	12.14	6.19	1.80	19.04	32.49	10.94	17.71
SPROC Rodler Fernandez	S	**		C LEN			110RG	978	96-1	-758	-755	-753	144	1-732	111-4	1-701	1-67	1-64	4-61(	81	4-55
r. E. F		***		TREAD TRACK TRACK NUMBEI	***** 0407 855	٠	OCKET RPH 4	-88.84-9783.34	-61.0*-9681.4*	12.64-7584.7# 146.84#	21.64-7558.64	31.74-7535.14	50.94-7449.74	75.7#-7321.2# 363.26#	102.04-7172.14 393.854	128.1*-7016.19	26.3# 159.0#-6757.8#	188.54-6479.04	36.1# 216.9#-6182.4#	244.64-5870.94	45.6# 271.7#-5547.7# 486.12#
		*		<b>v</b>	# E   # # b 4 # L 4 # # B E #		SPROCKET * RPH *			2.1*	3.5*	\$2.2	8.4#			21.1# 1	3# 1	31.3* 1	1# 2	40.9# 2	6# 2
<b>8</b> 2		******		* 19.5	**************************************		INNER PROP HP	14.54	10.0*	.2	ę.	·v.	÷	12.4	16.8	21.					
		**		VEHICLE WEIGHT, tons IN VELOCITY, mph = 45 EGROSS HP, = 500.0 INGINE HP, = 60.0 IL AREA, in, = 57.0	\$ 5 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4		2 2 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	165.50#	1.78# 112.50#	-18.21	-31.11#	-45.53#	0.340* 11.06* -72.24*	0.403# 13.45#-105.50#	0.453# 16.26#-139.22#	0.500* 19.26*-171.14*	0.500# 24.38#-204.56#	0.500 # 30.10 #- 232.48 #	36.424-255.34#	43.344-273.43#	0.500* 50.86*-287.01*
		**		16HT+ to mph m m 500.0 m 60.0	# # # # # # # # # # # # # # # # # # #		APPA		112	-18			1-72	-105	-139	111	-204	1-232	1-259	-273	182-4
		***	<b>=</b>	# # # # # # # # # # # # # # # # # # #			TURN # ADIUS# (+t) #	*00.0	1.784	8.62*	*60.6	<b>9.50</b> *	1.064	3.45	6.261	9.26	4.3Bi	01.0	6.42	3,34	0.86
		***	NI NI	ICLE ELOCI 3SS + VE MF	######################################	175:	### ####						0* 10	34 1	3# 1(	0 * 1	0 \$ 2	0 # 3			0 # 5
		* * *	DATA INPUT:	VEN: UN VI E GRE ENGIT		RESULTS:	#LATERAL# TURN # # ACCEL #RADIUS#APPARNT# # (9s) # (ft) # HP #	*000-0	0.084*	0.010	0.149*	0.253	0.34	0.40	0.45	0.50	0.50	0.50	0.500	0.500	0.50
		***	•	GROSS VEHICLE MEIGHT, tons = MAXIMUM VELOCITY, mph = 45.0 ENSINE GROSS HP. = 500.0 LOSS ENGINE HP. = 60.0 FRONTAL AREA, in. = 57.0				*00.0	1.50*	3.00*	<b>4.50</b>	<b>*00*9</b>	1.50*	\$00°6	*0	<b>*</b> 00	¥0\$	*00	¥05	<b>*</b> 0C	9.50
		****		0 x 10 -1 fr			VEH SPEED (mph)	•	=	3.	-	9.9	-	3.	10.50	12.00	13.50	15.00#	16.50#	18.00*	19.
				•																	

SPEED # ACCEL	#RADIUS#APPARNT# # (ft) # HP #	PROP H	A RPM &TORQUE &APPARNT&	PPARNT PRI	M4 4 40	*TORQUE # *(ftlbs)#	# # 64 64 64 64	# HP #
21.00	0.500* 58.99*-296.29*	50.34	50.3# 298.4#-5215.6# 492.65#	492.65#	62.5#370.29# 6987.6#	987.6*	41.8*	388.
22.50*	0.500# 67.72#-301.49#	\$5.0	55.0* 324.64-4877.5* 496.63*	469.63	66.4#391.77# 6657.8#	657.8	36.9*	393.4
24.00#	0.500* 77.054-302.83*	59.7	59.7# 350.6#-4536.2# 498.08#	480-864	70.4#413.56# 6	6325.6	32.54	395.1
25.50#	0.500* 86.98*-300.57*	64.5	64.54 376.44-4194.54 497.07*	497.07#	74.64435.59# 5	5993.4#	28.7*	393.1
27.00*	0.5004 97.514-294.974	69.2	69.2# 401.9#-3855.0#	493.72#	78.8*457.82# 5663.9#	\$6°E99	25.3#	389.5
28.50#	0.500*108.65*-286.32*	74.0*	74.0# 427.2#-3519.9# 488.22#	488.224	83.2#480.23# 5339.5#	339.5#	22.3#	382.7
30.00	0.500#120.38#-274.92#	78.94	78.94 452.44-3191.34	480.784	87.64502.79# 5022.2#	022.24	19.7*	373.5
31.50	0.5004132.724-261.064	83.8	83.8* 477.5*-2871.3* 471.63*	471.63*	92.2#525.47# 4714.0#	714.0#	17.3*	362.1
33.00#	0.500#145.66#-245.06#	88.7*	88.74 502.54-2561.44 461.044	461.04*	96.8*548.26# 4416.6#	416.6#	15.24	349.0
34.50#	0.500#159.214-227.25#	93.8*	93.8# 527.4#-2263.2# 449.26#	449.26#	101.64571.14# 4131.3#	131.3*	13.34	334.4
36.00#	0.500#173.35#-207.91#	98.9*	98.94 552.24-1977.74 436.578	436.57#	106.48594.11# 3	3859.34	11.7	318.5
37.50#	0.500+168.10+-187.37+	104.1*	104.1# 576.9#-1705.9# 423.22#	423.22#	111.4*617.15* 3601.7*	601.7#	10.24	301:7
39.00*	0.500#203.45#-165.89#	109.4	109.4# 601.5#-1448.4# 409.47#	409.47	116.5#640.26# 3358.9#	356.9*	8.94	284.2
*05.04	0.486#225.46#-133.95#	114.9#	114.9# 626.6#-1122.7# 384.79#	384.79*	121.54662.92# 30	3048.6#	7.2\$	256.0
45.00*	0.465#253.66# -95.32#	120.5	120.5# 651.9# -767.9# 353.60#	353.60*	126.7#685.38# 2	2709.6#	5.54	221.4
43.50#	0.442#286.56# -55.11#	126.2#	126.2# 677.2# -427.4#	321.52*	132.04707.874 2	2385.5*	4.13	185.5
*00"5	0.415*326.13* -13.66*	132-1#	132.1# 702.5# -102.1# 288.87#	288.87#	137.34730.36# 2077.3#	077.3\$	2.9	148.6

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HORSEPONER	REV.DATE:	
SPROCKET	RODLER	FERNANDEZ
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				# # # # # # # # # # # # # # # # # # #	SPROCKET W.E. RODLER L.M. FERNANDEZ	KET HORSEPOWE REV.DAT	ITE: 14 MAY	AY 1985			
					RUN DATE:	E: 15-AUG-85:11	5:115				
***	***	****	*******	***		***	******	****	***	**************************************	
_	DATA INP	PUT:									
200	AUTHAN SOUGH	F VETCHT.	HT. tons =	0.04	TREAD WIDTH.			GRADE, T	0.0		
MAXIX	MAXIMUM VELOCITY, MDA	CITY, m			TRACK LENGTM. in. = TRACK PITCH. in. =	in. = $183.1$ in. = $7.63$	_	COEFFICIENT OF FRICTION MAXIMUM ACCELERATION, 9	NT OF FR CCELERAT	ION, 05 = 0.50	
LOSS	ENGINE 6KO33 N°* LOSS ENGINE HP. FRONTAL AREA, in	֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓	120.0		NUMBER OF SPROCKET TEETH = ROLLING RESISTANCE, 16 per	SPROCKET TEETH	: 11 ton=	100.0 COEFICIENT OF	IT OF DRAG	6 = 1.00	
*****	******	****	******	*******	***********	***	***	****	**	安全安全的安全的安全的安全的安全的安全的安全的安全的安全的安全的安全的安全的安全	
Efficiency a by Crei	Efficiency a by Crai	ata for	ta for Westinghous G Joseph 10-MAY-85	Mestinghouse induction th 10-MAY-85	Uction motor & A tests to the test to the tests to the test to the	CONCEPT I:	TWIN PRI	PROPULSION MOTORS becatebetet	.s.	ta for Mestinghouse induction motor & CONCEPT I: THIN PROPULSION MOTORS g Joseph 10-MAY-85 assistatoressesses assistatores assistatores accesses assistatores accesses assistatores assista	
	RESULTS:	••									
		•									
VEH #LA SPEED # A (mph) # (	*LATERAL* ' * ACCEL *R' * (98) *		APPARNT#	INNER SPR PROP # HP #	SPROCKET **	# DUTER SP #TORQUE #APPARNT# PROP : #(ftlbs)# HP # HP :	SPROCKET ROP # RPM HP #	# #TORQUE # #(ftlbs)#	SCRUB #TR	44 X X 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	
*00*0	+000-0	0.00	349.19#	30.1	-71.2#-25773.#	349.31#	30.2# 71	30.24 71.18#25773.3#	319.14	0.1	
1.50*	*690.0	2.17#	235.50#	20.6	-48.64-25447.4 418.504	+18.50#	36.6¢ 86	86.38#25447.3#	298.4*	83.5	
3.00	0.058#	10.41	-36.58#	4.1*	9.7#-19794.#	# 303°30#	27.94 65	65.83#24245.0#	117.7*	158.4	
4.50#	0.123	11.01*	-63.25#	7.1*	16.94-19707.*	+ 443.71#	40.94 96	40.94 96.45424160.94	166.2*	236.6	
*00*9	0.209*	11.54*	+50*6- 1	10.6#	24.94-19621.4	* 578.74*	53.5#126	53.5#126.19#24088.2#	210.8#	314.4	
1.50#	0.286#	13.16#	3.164-143.79*	16.5*	38.94-19402.4	* 681.19*	63.7#149	63.7#149.93#23862.5#	228.64	368.9	
9.00*	0.346*	15.66	5.66#-207.94#	24.48	57.34-19054.4	+ 758.19#	72.0 #169	72.0*169.31*23519.9*	227.0#	459.3	
10.50	0.399#	18.46#	18.464-273.00#	32.74	16.84-18670.4	* 826.56*	79.94187	79.94187.60423141.04	220.54	526.2	
12.00*	0.446	21.57#	21.57#-336.72#	41.34	96.9*-18251.*	* 888.32*	87.5#205	87.5#205.27#22729.1#	211.4	589.4	
13.50#	0.493*	24.72	24.724-396.53#	46.64	116.84-17837.4	* 948-50*	95.34223	95.34223.17422321.74	203.48	649.8	
15.00#	0.500	30.10*	30.10*-458.07*	*0*09	140.34-17148.4	* 978.23#	101.64237	101.64237.41#21641.4#	179.3*	4.169	
16.50#	0.500	36.42	36.424-509.88#	70.1	70.1# 163.6#-16369.#1000.94#	#1000.94#	108.0#251	108.04251.88#20871.4#	156.54	736.5	
18.00*	*005*0		43.34#-551.21#	80.08	80.04 186.24-15551.41020.294	*1020.29*	114.7#26	114.7#267.08#20063.6#	137.2	768.4	
19.50	0.500		50.864-582.704	89.6	208.24-14702.41035.42#	#1035.42#	121.8428	121.84282.86419225.74	120.6#	193.0	

VEH #LATER SPEED # ACCE (mph) # (gs)	AL# TURN # L #RADIUS#APPARNT# # (ft) # HP #	INNER PROP HP	ROCKET RPM	ž.	DUTER SPROCKET	* * * * * * * * * * * * * * * * * * *	SCRUB #TRANSFR# HP # HP #	RANSFRA HP A
1.00	21.00# 0.500# 58.99#-604.90#	99.2*	99.2# 229.7#-13830.#1045.80#	*1045.80*	129.1#299.07#18365.6#	18365.60	106.34	810.4
22.50#	0.500# 67.72#-618.33#	108.6#	108.6# 250.9#-12943.#1051.19#	*1051.19#	136.7*315.65#17490.9*	17490.94	93.8#	820.7
\$4.00	0.500* 77.05*-623.52*	118.04	118.0¢ 271.8¢-12048.¢1051.53¢	#1051.53#	144.4*332.51#16609.2#	16609.2#	82.84	824.3
25.50#	0.500# 86.98#-621.03#	127.4	127.4# 292.5#-11152.#1046.92#	*1046.92#	152.3#349.61#15727.5#	15727.5#	73.1\$	821.5
27.00*	0.5004 97.514-611.45*	136.84	136.84 313.04-10261.41037.59#	*1037.59*	160.4*366.91*14852.6*	14852.6#	64.54	812.7
28.50	0.500#108.65#-595.40#	146.2*	146.2# 333.3# -9383.#1023.90#	<b>#1023.90</b>	168.64394.37413990.64	13990.6#	\$6.9\$	7.88.4
30.00*	0.5004120.384-573.524	155.6#	155.6* 353.4* -8523.*1006.25*	*1006.25*	177.0*401.98413147.3*	13147.34	50.1*	179.2
31.50	0.500#132.72#-546.48#	165.1*	165.1# 373.5# -7685.# 385.12#	* 385.12*	185.50419.71412327.5*	12327.5#	*0.44	755.6
3.00	33.00# 0.500#145.66#-514.94#	174.6#	174.6# 393.4# -6875.# 961.03#	# 961.03¢	194.2#437.54#11535.7#	11535.74	38.7*	728.2
+05.4	34.504 0.500#159.214-479.57#	184.24	184.24 413.34 -6095.4 934.49#	* 934.49*	203.04455.47#10775.8#	10775.84	33.9#	697.6
36.00*	0.500#173.35#-441.03#	193.84	193.8# 433.0# -5349.# 906.07#	* 906.07*	211.94473.48\$10050.7\$	10050.7*	29.74	664.5
37.50	0.500*188.10*-399.96*	203.5#	203.5# 452.7# -4640.# 876.29#	# 876.29#	221.0#491.55# 9362.9#	9362.9#	25.94	629.4
39.00*	0.500#203.45#-356.96#	213.4	213.4# 472.3# -3969.# 845.67#	# 845.67#	230.24509.694 8714.24	8714.2#	22.5*	592.9
.50	40.50# 0.500#219.40#-312.62#	223.3#	223.34 491.94 -3338.4 814.72*	# 814.72#	239.64527.884 8105.94	8105.94	19.6#	555.5
45.00#	0.500#235.95#~267.45#	233.3#	233.3# 511.4# -2746.# 783.89#	# 783.89#	249.24546.13# 7538.7#	7538.7*	17.04	517.8
43.50#	0.5004253.114-221.94#	243.5#	243.5# 530.9# -2195.# 753.60#	* 153.60*	258.84564.41# 7012.6#	7012.6*	14.74	480.1
42.00*	0.500#270.86#-176.52#	253.7#	253.74 550.44 -1684.4 724.244	4 724.248	268.7#582.74# 6527.4#	6527.4#	12.7#	442.9

SPROCKET HORSEPOWER BY: W.E. RODLER REV.DATE: 13 JUNE 1985 R.E. LEWIS
RUM DATE: 15-AUG-85:116 ***********************************
DATA INPUT:
GROSS VEHICLE WEIGHT, tons = 40.0 TREAD WIOTH, in. = 109.8 GRADE, T = 0.0  MAXIMUM VELOCITY, mph = 45.0 TRACK LENGTH, in. = 103.1 COEFICIENT OF FRICTION = 0.70  ENGINE GROSS HP. =1000.0 TRACK PITCH, in. = 7.63 4AXIMUM ACCELERATION, GB =0.50  LOSS ENGINE HP. = 120.0 NUMBER OF SPROCKET TEETH = 11 COEFICIENT OF DRAG = 1.00  FRONTAL AREA, ft.2 = 68.3 ROLLING RESISTANCE, LD por ton = 100.0 PROPLESION MOTOR EFF. = 94.  STEER MOTOR EFF. T = 92.
osecterrecenterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterrecentraterre
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VEM. & LAT.* TURN & INNER SPROCKET & CUTER SPROCKET & STEER MOTOR & PROPULSION MOTOR \$SCRUB#TRANS Speed *acceleradius *aparnt*prop * RPM *TORQUE * RPM *TORQUE* HP * RPM *TORQUE* HP * RPM *TORQUE* HP * TORQUE* HP *
作品表现的影响,我们们们有一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个
1.50 #.0720# 2.09# 247.5# 21.6#-51.0#-25459.# 423.9# 37.6# 88.8# 25064.# 731.2# 6965.5# 551.4# -1.5# 398.3# -19.9#309.4# 83.5
3.00 *.1470* 4.09* 161.1* 14.20-33.6*-25161.\$ 509.8\$ 46.3\$109.2\$ 24527.\$ 734.1\$ 7110.2\$ 542.3\$ -4.9\$ 796.6\$ -32.0\$311.7\$164.9
6.024 76.74 6.94-16.24-24880.4 593.94 54.94129.54 24087.4 738.24 7255.24 534.44 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
6.00 4.30408 7.024 -6.65 0.75 1.75-20149.# 674.0# 63.40149.6# 23700.# 669.8# 7331.9# 478.5# 34 1893.4# 179.1#314.3# 66.00 4.304.0# 678.8# 73.51.# 7.50 4.3790# 9.924 -78.8# 7.50 4.3790# 9.924 -78.8# 7.50 4.3790# 9.924 -78.8# 7.50 4.332.5# 471.3# 66.3# 1991.4# 174.9#309.6#397.1
9.00 \$.4540\$ 11.934-148.44 16.94 39.88-19573.\$ 817.3\$ 79.4\$186.88 22980.\$ 647.2\$ 7319.5\$ 464.45 78.29 2389.7\$ 171.9\$4305.1\$470.4
10.50 a.5000¢ 14.74-229.4 26.7¢ 62.8¢-19178.¢ 864.5¢ 85.8¢201.6¢ 22525.¢ 598.7¢ 6909.6¢ 455.1¢ 89.6¢ 2788.0¢ 168.9¢282.8¢539.0
12.00 #.5000# 19.26#-319.4# 38.5# 90.4#-18560.# 881.1# 90.3#211.8# 21851.# 507.7# 6045.9# 441.0# 100.7# 3186.3# 166.0#240.4#598.3 # # # # # # # # # # # # # # # # # # #

50.854-582.74 89.64208.24-14704.4 972.14121.84282.94 18049.4 253.24 3720.54 357.44 166.44 5177.84 168.84120.74793.0

19.50 #.5000#

18.00 \*.5000# 16.50 4.5000#

13.50 \*.5000# 15.00 #.5000#

24.374-195.04 49.54116.04-17882.4 901.54 95.64223.94 21145.4 435.84 5374.14 425.94 112.34 3584.64 164.64206.74651.3 30.09e-458.1# 60.0e160.3e-17149.¢ 922.5¢101.6¢237.4# 20408.¢ 377.5¢ 4836.7¢ 409.9¢ 124.7¢ 3982.9¢ 164.4¢179.3¢697.4 36.41\$-509.9\$ 70.1\$163.64-16370.\$ 942.1\$108.0\$251.9\$ 19644.\$ 329.0\$ 4397.0\$ 393.0\$ 137.8\$ 4381.2\$ 165.1\$156.5\$736.5

***********	229.# 223.0# 3454.8# 339.0# 181.9# 5576.1# 171.3#106.3#810.  400.# 196.6# 3224.5# 320.2# 198.3# 5974.3# 174.3# 93.8#820.  569.# 173.5# 3022.9# 301.4# 215.4# 6372.6# 177.5# 82.8#824.  742.# 153.1# 2845.1# 282.6# 233.4# 6770.9# 181.0# 73.1#821.  924.# 135.0# 2645.0# 264.0# 252.0# 7169.2# 184.6# 64.5#812.  120.# 119.0# 2545.6# 245.6# 271.4# 7567.5# 189.4# 56.9#779.  8 35.# 104.8# 2418.3# 227.6# 291.5# 7965.8# 192.2# 50.1#779.  8 335.# 104.8# 2418.3# 227.6# 291.5# 7965.8# 192.2# 50.1#779.  8 388.# 80.9# 2198.5# 193.3# 333.4# 8762.4# 199.8# 38.7#728.  8 134.# 70.9# 2102.9# 177.1# 355.2# 9160.7# 203.6# 33.9#697.  8 4 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	223.0¢ 3454.8¢ 339.0¢ 181.9¢ 5576.1¢ 171.3±106.3¢810. 213.0¢ 3454.8¢ 339.0¢ 181.9¢ 5576.1¢ 171.3±106.3¢810. 2	######################################	**************************************
6#250.9#-12945  0#271.8#-12049  4#292.5#-11153  8#313.8#-9385  6#353.4#-9852  6#393.4#-6877  6#413.2#-6697  8#4413.2#-4642  6#472.3#-3971	400.0 196.6 3224.5 4 569.0 173.5 4 3022.9 4 173.5 4 3022.9 4 174.2 4 135.1 4 2845.1 4 175.2 4 135.1 4 184.2 4 135.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4 184.2 4	320.2* 198.3* 597 301.4* 215.4* 637 282.6* 233.4* 677 264.0* 252.0* 716 245.6* 271.4* 756 227.6* 291.5* 796 210.2* 312.2* 836	4.34 174.34 93. 2.64 177.54 82. 0.94 181.04 73. 9.24 184.64 64. 7.54 188.44 56. 5.84 192.24 50. 4.14 196.04 64.	**************************************
0#271.8=-12049. 4#292.5=-11153. 8#313.0=-10263. 2#333.3=-9385. 2#333.4=-8525. 6#393.4=-6872. 1#413.2=-6097. 1#413.2=-6097. 8#43.0=-5351. 4#472.3=-3971.	569.# 173.5 # 9 # 174.5 # 9 # 174.5 # 175.9 # 9 # 9 \$ 4 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ 5 # 9 \$ \$ 6 \$ 5 # 9 \$ \$ 6 \$ 5 # 9 \$ \$ 6 \$ 5 # 9 \$ \$ 6 \$ 5 # 9 \$ \$ 6 \$ 5 # 9 \$ \$ 6 \$ 5 # 9 \$ \$ 6 \$ 5 # 9 \$ \$ 6 \$ 5 # 9 \$ \$ 6 \$ 5 # 9 \$ \$ \$ 6 \$ 5 # 9 \$ \$ 6 \$ 5 # 9 \$ \$ 6 \$ 5 # 9 \$ \$ 6 \$ 5 # 9 \$ \$ 6 \$ 5 # 9 \$ \$ 6 \$ 5 # 9 \$ \$ 6 \$ 5 # 9 \$ \$ 6 \$ 5 # 9 \$ \$ 6 \$ 5 # 9 \$ \$ \$ 6 \$ 5 # 9 \$ \$ 6 \$ 5 # 9 \$ \$ 6 \$ 5 # 9 \$ \$ 6 \$ 5 # 9 \$ \$ 6 \$ 5 # 9 \$ \$ 6 \$ 5 # 9 \$ \$ 6 \$ 5 # 9 \$ \$ 6 \$ 5 # 9 \$ \$ 6 \$ 5 # 9 \$ \$ \$ 6 \$ 5 # 9 \$ \$ 6 \$ 5 # 9 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ 6 \$ \$ \$ 6 \$ \$ 6 \$ \$ \$ 6 \$	301.44 215.44 637 282.64 233.44 677 264.09 252.09 716 245.69 271.44 756 227.64 291.59 796 210.24 312.28 836 193.34 333.44 876	2.6# 177.5# 82. 0.9# 181.0# 73. 9.2# 186.6# 66. 7.5# 188.4# 56. 5.8# 192.2# 50. 4.1# 196.0# 64. 2.4# 199.8# 38.	.8#824.4 .1#821.6 .5#812.9 .9#798.6 .1#779.3
##292.54-11153. ##313.04-10263. ##333.34-9385. ##373.54-8525. ##373.54-6877. ##413.24-6697. ##413.24-6697. ##413.24-6697.	742.# 153.1# 2845.1# 924.# 135.0# 2687.0# 120.# 119.0# 2545.6# 130.# 119.0# 245.6# 135.# 104.8# 2418.3# 573.# 92.2# 2303.2# 838.# 80.9# 2198.5# 134.# 70.9# 2102.9# 663.# 62.0# 2015.3#	282.6* 233.4* 677 264.0* 252.0* 716 245.6* 271.4* 756 227.6* 291.5* 796 210.2* 312.2* 836 193.3* 333.4* 876	0.9* 181.0* 73. 9.2* 184.6* 64. 7.5* 188.4* 56. 5.8* 192.2* 50. 4.1* 196.0* 44.	.18821.6 .58812.9 .98798.6 .18779.3
######################################	924. # 135.0# 2687.0# # 120.# 119.0# 2545.6# # 135.4 104.8# 2418.3# # 135.4 104.8# 2418.3# # 134.8 10.9# 2102.9# # # # # # # # # # # # # # # # # # #	264.0% 252.0% 716 245.6% 271.4% 756 227.6% 291.5% 796 210.2% 312.2% 836 193.3% 333.4% 876	9.24 184.64 64.7.54 189.24 56.45 64.14 196.04 64.2	.54812.9 4.94798.6 4.14779.3 4.14755.7 14755.7
64353.44 - 8525. 64353.44 - 8525. 64393.44 - 6877. 64393.44 - 6877. 84413.24 - 6097. 84413.24 - 6097. 84413.24 - 6097. 84413.24 - 6097. 84413.24 - 6642. 84413.34 - 5351. 84413.34 - 5351.	120.* 119.0* 2545.6¢ 335.¢ 104.8¢ 2418.3¢ 573.* 92.2¢ 2303.2¢ 838.* 80.9¢ 2198.5¢ 134.¢ 70.9¢ 2102.9¢ 653.¢ 62.0¢ 2015.3¢	245.6# 271.4# 756 227.6# 291.5# 796 210.2# 312.2# 836 193.3# 333.4# 876	7.5# 188.4# 56. 5.8# 192.2# 50. 4.1# 196.0# 44.	94798.6 4 14779.3 4 14755.7 74728.3
64353.44 -8525. 14373.54 -6877. 64393.44 -6877. 14413.24 -6097. 84433.04 -5351. 84472.34 -3642.	335.# 104.8# 2418.3# 573.# 92.2# 2303.2# 638.# 80.9# 2198.5# 134.# 70.9# 2102.9# 653.# 62.0# 2015.3#	227.6# 291.5# 796 # 210.2# 312.2# 836 193.3# 333.4# 876	5.8# 192.2# 50. # 11 196.0# 64. # 199.8# 38.	1#779.3 1#755.7 1#728.3
14373.54 - 7687.4 64393.44 - 6877.4 11413.24 - 6097.4 84433.04 - 5351.4 5442.74 - 4642.4 44472.34 - 3971.4	573.* 92.24 2303.24 573.* 92.24 2303.24 538.* 80.94 2198.54 # # 70.94 2102.94 653.* 65.04 2015.34 * * * * * * * * * * * * * * * * * * *	210.2# 312.2# 836 # # # # 836 # # # # # # # # # # # # # # # # # # #	5.6# 192.2# 50. 4.1# 196.0# 44. 4.1# 199.8# 38.	.1*779.3 * .1*755.7 *
14373.54 -7687.4 64393.44 -6877.4 14413.24 -6097.4 84433.04 -5351.4 54452.74 -4642.4 44472.34 -3971.4	573.* 92.24 2303.24 838.* 80.94 2198.5 4 4 4 134.2 70.94 2102.94 653.0 62.0 6.94 4 6.94 6.94 6.94 6.94 6.94 6.94 6.	210.2# 312.2# 836 # # # 193.3# 333.4# 876	4.14 196.04 44. 4 4 899.84 38.	.1*755.7
6#393.4# -6877. 1#413.2# -6097. ##43.0# -5351. \$#43.0# -5351. \$#472.3# -3971. ##472.3# -3971.	830.* 80.9* 2198.5* 134.* 70.9* 2102.9* ***********************************	193.3# 333.4# 876 # #	2.4* 199.8* 38,	.7*728.3
1#413.2# -6097.# 878.8#203.0#455.5# 10134.# # # # # # # # # # # # # # # # # # # #		*	· · · · · · · · · · · · · · · · · · ·	
# # # # # # # # # # # # # # # # # # #	* * *	177.14 355.24 916	* * * 0.7* 203.6* 33.	* 94697.8
64452.74 -4642.4 826.14221.04491.64 8827.4 \$4452.74 -4642.4 826.14221.04491.64 8827.4 \$4472.34 -3971.4 798.44230.24509.74 8227.4 \$4472.34 -3971.4 798.44230.24509.74 8227.4	» #	*	*	*
54452.74 -4642.4 826.14221.04491.64 8827.4 4 4 4 4 5 3 -3971.4 798.44230.24509.74 8227.4 4 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5		161.7# 377.5# 955	9.0* 207.4* 29. *	.7#664.7
203-618-357-1#213-646472-34 -3971-# 798-64230-24509-7# 8227-# # # # # # # # # # # # # # # # # # # #	827.# 54.1# 1934.7#	54.1# 1934.7# 147.0# 400.2# 9957.2# 211.1# 25.9#629.6	7.29 211.14 25.	.9*629.6
# # # # # # # # # # # # # # # # # # #		47.2* 1860.3* 133.1* 423.3*10355.5*	5.5* 214.7* 22.6*593.	* .6*593.1
サード・コンド・コンド・コンド・コンド・コンド・コンド・コンド・コンド・コンド・コン	* *	* * *	* * *	#
*******************************	· #	# # # # # # # # # # # # # # # # # # #	3.64 616.64 19.64335. 4 A A	*********
.00 %.5000% 235.90%-267.6%233.3%511.6% -2748.% 742.6%249.2%546.1% 7142.% 35.5%	142.# 35.5# 1727.4#	107.94 470.6411152.14	2.14 221.64 17.04517	.04517.9
.50 #.5000# 253.06#-222.1#243.5#530.9# -2197.# 715.4#258.8#564.4# 6657.# 30.7#	\$57.* 30.7¢ 1667.8	96.64 494.7411550.44	0.4# 225.0# 14.7#480.	.7#480.3
# # # # # # # BUILDER		*	*	*
##*97 #*KN79 #1*79641*8897*0*689 **8997* #**************** # # # # # # # # # #	* * * * * * * * * * * * * * * * * * *	86.24 519.1411948.74 228.24 12.74443.	8.7¢ 228.2¢ 12. * *	.7#443.1

RUN DATE:No. 15-AUG-85:116

SPROCKET HORSEPONER

SPROCKET HORSEPORRESPRENCE SPROCKET HORSEPORE CONTER SPROCKET 14 MAY 1985 BY: W.E. RODLER REV.OATE: 14 MAY 1985 L.M. FERNANDEZ	RUN DATE: 15-AUG-85;114	安全的安全的安全的安全的安全的安全的实现实现实现实现实现实现实现实现实现实现实现实现实现实现实现实现实现实现实现	DATA INPUT:	
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40.0

GRADE, % = 0.0 COEFFICIENT OF FRICTION = 0.70 MAXIMUM ACCELERATION, 9s =0.50 COEFICIENT OF ORAG \* 1.00 # SCRUB #TRANSFR# #TORQUE # HP # HP # 314.0 367.1 455.7 520.1 580.9 4.769 688.1 733.7 768.4 9:1 158.1 236.3 153.44 120.64 165.54 137.2\* 301.94 283.6# 115.04 162.6# 206.9 215.7\* 209.3 198.5\* 188.6 178.0\* 121.84282.86419225.74 100.24234.27421383.64 107.7#251.17#20800.0# 35.2# 83.08#25430.6# 27.7# 65.25#24213.6# 40.6# 95.65#24128.7# 53.2#125.31#24059.3# 62.4#147.03#23761.6# 70.34165.35423357.14 77.74182.66422898.84 85.3#200.14#22433.3# 92.84217.43421937.84 114.7#267.08#20063.6# 28.5\* 67.34\*25773.3\* \*(ft1bs)\* TREAD WIDTH, in. = 109.8

TRACK LENGTH, in. = 183.1

RACK PITCH, in. = 7.63

NUMBER OF SPROCKET TEETH = 11

ROLLING RESISTANCE, ID per ton= 100.0 VEH BLATERALG TURN & INNER SPROCKET & OUTER SPROCKET SPEED & ACCEL BRADIUS&APPARNT& PROP & RPM \$TORQUE &APPARNT& PROP & RPM (mbh) & (gs) & (ft) & HP & HP & \$C(ftlbs) & HP & HP & 52.34 122.54-17453.4 909.174 61.4# 143.4#-16890.# 953.83# 70.4# 164.3#-16297.# 994.70# 80.04 186.24-15551.41020.294 208.2#-14702.#1035.42# 41.8#-19301.# 665.20# 61.34-18892.# 735.34# 81.74-18428.# 796.38# 43.5# 102.0\*-17956.# 854.86# 28.54 -67.34-25773.4 330.444 25.84-19603.4 574.014 19.24 -45.34-25431.4 402.264 10.34-19762.4 300.834 17.74-19675.4 439.424 \*\*\*\* 10.9# 1.5# 17.8\* 26.0\* 89.68 34.8\* GROSS VEHICLE WEIGHT, tons \*\*
MAXIMUM VELOCITY, mph \*\* 45.0
ENGINE GROSS HP. \*1000.0
LOSS ENGINE MP. \*\* 120.0 0.500# 43.34#-551.21# 0.404# 23.83#-348.80# 0.468# 32.17#-461.26# 0.4924 37.014-509.86# 0.500# 50.36#-582.70# 0.000\* 0.00\* 330.32\* 0.066# 2.28# 219.38# 0.057# 10.63# -38.72# 0.120# 11.24# -66.17# 0.205# 11.75# -96.21# 0.2714 13.894-153.69# 0.321# 16.85#-220.40# 20.274-286.78 0.440# 27.71#-407.10# FRONTAL AREA, in. = 68.3 RESULTS: 4,96.0 1.50\* \*00.0 1.50 19.50# 3.00# **\*\* 20 \* \*00\*9** \*00.6 10.50\* 12.00# 13.50# 15.00# 16.50#

	RANSFR# HP #	810.4	820.7	824.3	821.5	812.7	798.4	179.2	155.6	728.2	697.6	664.5	4.629	592.9	555.5	513.9	453.9	392.0	******
	SCRUG #1RANSFR# HP # HP #	106.3*	93.8#	82.8	73.1\$	64.5*	\$6.95	50.1*	*0.44	38.7*	33.9*	29.7*	25.9#	22.5*	19.6#	16.8	13.4	10.54	******
	# #TORQUE # #(ftlbs)#	129.1#299.07#18365.6#	136.7#315.65#17490.9#	144.44332.51#16509.2#	152.3#349.61#15727.5#	160.4#366.91#14852.6#	168.64384.37413990.64	177.0*401.98*13147.3*	185.5#419.71#12327.5#	194.24437.54411535.74	203.04455.47*10775.8*	211.94473.48#10050.7#	221.04491.55# 9362.9#	230.24509.694 8714.24	239.6*527.88* 8105.9*	249.1#546.04# 7500.4#	258.64563.864 6761.44	268.24581.684 6055.64	***************
RUN DATE;No. 15-AUG-85;114	INNER SPROCKET & OUTER SPROCKET PROP & RPM *TORQUE &APPARNI* PROP & RPM * HP * HP * HP *	99.24 229.74-13830.41045.804	108.64 250.94-12943.41051.194	118.0* 271.8*-12048.#1051.534	127.4# 292.5#-11152.#1046.92#	136.8# 313.0#-10261.#1037.59#	146.2# 333.3# -9383.#1023.90#	155.64 353.44 -8523.41006.254	165.14 373.54 -7685.4 985.124	174.64 393.44 -6875.4 961.034	184.24 413.34 -6095.4 934.494	193.8# 433.0# -5349.# 906.07#	203.5# 452.7# -4640.# 876.29#	213.4# 472.3# -3969.# 845.67#	223.34 491.94 -3338.4 814.724	233.4# 511.5# -2708.# 779.79#	243.74 531.54 -1944.4 725.894	254.24 551.44 -1213.4 670.684	
SPROCKET HORSEPOWER RU	AL  TURN	0.500# 58.99#-604.90#	0.500# 67.72#-618.33#	0.500* 77.05*-623.52*	0.500* 86.984-621.03*	0.500# 97.51#-611.45#	0.500#108.65#-595.40#	0.500#120.38#-573.52#	0.5004132.724-546.484	0.500#145.66#-514.94#	0.500#159.21#-479.57#	0.500#173.35#-441.03#	0.500*188.104-399.96*	0.500#203.45#-356.96#	0.500*219.40*-312.62*	0.497#237.11#-263.76#	0.483#261.81#-196.75#	0.467#289.79#-127.33#	*****************
SPROCKET	VEH *LATERI SPEED * ACCEI (mph) * (98)	21.00	22.50*	24.00*	25.50	27.00*	.28.50	30.00	31.504	33.00	34.50#	36.00*	37.504	39.00*	+05.04	45.00*	43.50#	42.00*	******

## B.2.D Gear Speeds And Loads at Maximum Turn Conditions

The following tables provide the torque and speed data for all gears during maximum turn conditions. These tables are divided into the same three divisions as the previous tables. The Title Heading and the inputs are the same as the previous section. The data format facilitates analysis by placing speeds and torques of each component in adjacent positions.

The first row of the results section lists the components by name or by identification letter shown on the gear configuration diagrams. The next segment defines the data arrangement; typically RPM above a dotted line and torque in pound-feet immediately below. The data output is immediately below, with horizontal dotted lines for each 1.5 MPH increment, and corresponding and speeds and torques above and below the dotted line.

GEAR LOADS AT MAXIMUM TURN CONDITION

BY: RICK LEWIS;

REVISION: 16-JUL-85 RUN DATE: 20-AUG-85;5

INPUT DATA:

ROLLING RESISTANCE, 1b per ton= 100.0 TREAD WIDTH, in. = 92.5
TRACK LENGTH, in. = 150.0
TRACK PITCH, in. = 6.03
NUMBER OF SPROCKET TEETH; = 11 19.5 GROSS VEHICLE WEIGHT, tons = NAXIMUM VELOCITY, mph = 45.0 FRONTAL AREA, ft^2 = 57.0 ENGINE GROSS HP. = 500.0 LOSS ENGINE HP. = 60.0

GRADE, X = 0.0 COEFFICIENT OF FRICTION = 0.70 MAXIMUM ACCELERATION, 9s =0.50 COEFICIENT OF DRAG = 1.00

Ē	Efficiency data for Westinghouse by:Craig Joseph 10-MAY-85	rai	ta for We g Joseph	esti 10-	Inghouse MAY-85		induction motor	noto	# # L	AL.	ALTERNATIVE I THIN DRIVE MOTOR	E I	TOR SET-UP	9									
###### MAX # VEH #	4÷÷÷¢÷±÷¢÷±¢÷*;**;***********************	* * *	aaaaaa Outer Sprok	* * * *	<del>¢</del> ¢¢¢¢¢¢ Inner Hotor=A	# # # # # #	÷÷÷÷÷÷ OUTER MOTOR=A	* * *	TANER :	* * * *	******* OUTER *	# # #	****** INNER C & D	# # #	tottattattattattattattattattattattattatt	# " # # #	ቱቅቱቅቀቀቱ INNER :	* * * *	<del>44444</del> OUTER E	# # # # # #	******* INNER *	÷÷÷÷÷ ∵ DUTER c F	\$ U
# HOH	RPM	#	RPM	#	RPM	¥	<b>X</b>	*	M M	#	RPK	#	RPM	#	R P M	#	R P K	#	M d	#	RPM #	RPM	<b>T</b>
	TORQUE ftx1bs		TORQUE		TORQUE ftx1bs		TORQUE ftx1bs		TORQUE ftx16s		TORQUE		TORQUE ftx1bs		TORQUE		TORQUE		TORQUE		TORQUE	TORQUE ft1bs	ORQUE ftlbs
<b>*0°0</b>	֥ +6-	*	<b>\$**</b>	#	1840.4	#	1839.#	#	-604.#	#	604.*		-166.#	#	166.#	24.	435*	45	-435.	#	<b>**•</b>		94.
-	-9783.1	-	9783.	-	1-96+	-	-495.	_	-1551-	<u> </u>	1651.		-5547.1	_	5547	_	530.1	_	-530	_	-8665.1		8664.
Ī	±-99-	#	114.*	#	2218.*	*	1285.	#		#	455.	м	-200-	#	116.#	*	524.#	<b>45</b> ·	-304-#	#	<b>-66.</b>		114.
B <b>-</b> 54		-	9687.1	-	491.1	-	-067-	_	-1634.1	_	1634.	! ! !	-5492	<u> </u>	5492	_	524-	_	-524.1	_	-8579.1	8.5	578
1	12.*	#	83.4	#	1630.	#	236.*	#	-535.	44	-78°	14	-147.	*	-21.		385.	#	56.	#	12.*		83.
	-7592.	-	9308.	-	471.	-	-384-	_	-1570.	_	1281.1		-5278.1	_	4304.	<u> </u>	504.	_	-411-1	!	-6527.1	84	439.
4.5*	21.*	#	122.	# 1	2390∙≑	#	410.*	#	-785.	46	-135.		-216.	故	-37.*	H	565.	43	\$1.4	#	21.*		122.
-	-7565.1	-	.9283.1	_	470.	-	-383.	_	-1566-	_	1276.1		-5264-1	_	4289.		502.1	_	-409-1	!	-6503.1	84	8417.
<b>÷0°9</b>	31.*	*	160.	# [	3127.*	# !	\$°909	#	-1027.	Ŧř.	-199.*		-282.	푠	-55-#	24	739.4	*	143.#	#	31.*		160.
-	-7541.	-	9261.	-	469.	-	-382-	_	-1562.	_	1272.		-5251.	-	4276.1	_	501.1	_	-408-1		-6482.1	83	398.
7.5#	<b>4.7.</b>	#	192.#	*	3749.	*	918.	#	-1231.	41.	-301.*		-338•≄	ĸ	-83	#	886.4	٠ د ''	217.	#	41°		192.
-	-7482.1	-	9205.1	-	466-1	_	-379.1	_	-1553-	_	1262.		-5219.1	_	4242-		498-1	_	-405.	_	-6459-1	83	348.
<b>0.6</b>	#*02	#	216.#	#	4224.#	# 1	1376.	*	-1387.	ąc.	-452.	i	-381.	44	-124.		<b>**666</b>	*	325.	#	70.4	1	216.
_	-7373-1	-	9099.1	_	461.	_	-373.1	_	-1535.	_	1244.1		-5159.1	_	4181.	_	492.	_	-399.	!	-6332.1	8.2	8255.

OUTER F	RPM	TORQUE ftlbs	239.	8151.	254.	7947	271.	1723.	289.	7482.	308.	7225.	329.	•9569	349.	6577.	370.	6391.	392.	6100.	414.	5807.	436.	5514.	458.	5223.
INNER # OL F #	RPM #	TORQUE! TO	95.#	-6224.1	128.	-9109-	159.#	-5786.1	188.≄	5539.1	217.	5276.1	245.≄	1-6665-	272.*	4712.1	298.≄	4417.	325.	4117.1	351.≄	-3813.1:	376.≄	3510.	402.*	-3208-1
##	#		<b>4*0</b> **	<u>~</u>	592.	380-1 -	734.¢	366.1 -	870.4	351.1 -	002.*	335.  -	1130.	318.1 -	1255.	300.1 -	1378.*	282.1 -	\$000	264-1 -	1620.\$	246.1 -	1738.4	227.1 -	1856.#	- 209.1 -
# OUTER # E	# RPM	TORQUE   ftxlbs				_		'	#	· ·	#	•		1	,,	<b>1</b>		7	1	-		-		-		
INNER	RP M	TORQUE ftxlbs	1104.*	486-1	1173.	474-	1251.*	460.1	1336.	445.	1425.	429.1	1517.	413.1	1613.	396.	1710.	378	1810.≎	360	1910-*	342	2012.	324.	2115.#	307-1
0UTER #	RPM #	TORQUE'   ftxlbs	-168.*	4112.1	-226.#	3978.1	-280.*	3832.1	-332•≄	3674.1	-383.≄	3506-1	-431.4	3329.1	±*62+-	3146.	-526.*	2958.1	-573.#	2766.1	-618.	2572.1	-564.	2379.1	<b>**60</b> 2-	2186.1
##	#		#	-	#	-	*	-	#	-	*	-	#	-	#	-	#	-	#	-	*	-	#	-	*	-
INNER C & D	RPM	TORQUE ftx1bs	-422*	-5092	-448	-4961	-478	-4818.1	-510	-4663	-544.	-4498	-579	-4325	-616	-4146.	-653	-3962	-691	-3775.	-729	-3587	-768	-3399	-807	-3212.
v # #	#		611.*	3.1	2.#		* • •		**	3.1	2.4	3-1	#•0	1.1	#	36.1	**	.1.0	3•≉	3.1	*•0	5.1	<b>*</b>		*	1-059
0-AUG-85;5 OUTER #	RPN	TORQUE ftx1bs	-61	1223.	-822.	1184	-1020	1140	-1209	1093	-1392	1043.	-1570	991	-1744	93	-1915	880	-2083.	823.	-2250	765	-2415.	108	-2579	9
* # #	#		<b>*•</b>	5.1	<b>*</b> • 0	6-1	8 *		**9	7.1	# 6	8-	*	7.1	#• 		* 9	1.6	*	3.1	***	7.1	\$.	1.1	*	956-1
DATE:NO Inner B	RPA	TORQUE ftxlbs	-1534	-1515	-1530	-1476	-1738	-1434-	-1856	-1387	-1979	-1338	-2108	-1287	-2241	-1234	-237	-117	-251	-112	-255	-1067	-2795.	-1011	-2938	<b>56-</b>
8 # #	#		**	-367.1	# <del>*</del> #	5.1	7.4	2.1	# e	8.	# 6	3.1	# 0	297.1	<b>*</b> •0	1.1	**	-264.1	#	247.1	<b>7-</b>	-230.1	*	-212-1	₩. #	-195.1
DUTER Motor=A	X P X	TORQUE	1861	-36	2503	-355	3107	-345	3683	-328	4239	-313	4780	-29	5310	-281.	5830	-26	6344	-24	6852	-23	7354	-21	7853	-19
##	# 1		2.#	5.1	3.4	3.1	# # *	0.1	1.*	17.1	#	2.1	*•0	386.1	<b>*•</b>	0.1	# 9	354.1	**	7.1	2.#	320.1	2-#	304.1	7.*	287.1
CONDITION : INNER : MOTOR=A	RPM	TORQUE ftx1bs	4672	455	.4963	443	5293.	430	5651	41	6028	402	6420	38	6824	370	7236.	35	7656	337	8082	32	8512.	30	8947	78
TURN C	#		239.#	8981.1	254.*	8750.1	271.*	1.1	<b>*</b> •6	224.1	# 80	13.1	329.¢	8.1	<b>*</b> •6	2.1	# 0	1-8869	2.4		614.#	6326.1	436-#	5994.1	*	5664.1
HAXIMUM TU # OUTER # SPROK	RPM	TORQUE	53	868	25	878	72	8497	289.	822	308	7933.	32	7628	349	7312	370	869	392	6658	4.1	632	<b>6</b> .	565	458	566
	#		95.4	1-1	# 80	1.9	<b>**</b> 69	8.	**	1.6.	***	3.1	# 2	1.1	₹.2.		# • •	5216.1	‡• \$	- 8	1.	537.1	# 9	4195.1	2.≄	3856.1
LOADS AT INNER SPROK	A P	TORQUE	on .	-7251.1	128	-7016	159	-6758	188	-6479-1	217	B-5	245	-5871	272	-5548	298	-521	32	-4878	351	-453	37	-419	402	-385
GEAR L Max # Vem #	# Hd#		10.5*	-	12.0≎	-	13.5#	-	15.0#	-		υ <b>-</b> Ο	J	<del>-</del> ;	•	-	21.0*	-	22.5	-	24.0#	_	25.5	-	27.0*	-

		шv		7.	М 1	•	. 5	•	<b>.</b>	•		e m	•		7.	7.	•	•	e 1		7.	•6	• 1	7.	÷ 1	• • #
OUTER F	RPM	TORQUE ft1bs	480	4937.	503	4657.	525	4386.	548	4124.	571	3873	594	3634.	617.	3407	049	3194	663	2994	687	2809.	710	2637	733	2479
##	#	E S	*	-	#	-	*	-:	*	:	*	=	*	=	#	-:	*	-:	626.#	-	*	-:	*:		<b>*-00</b> 2	
INNER	RPM	TORQUE! ftlbs	427	-2910	452	-2618	478	-2333	505	-2057	527	-1791	552	-1537	577	-1295	602	-1065	626	-348.1	651	-645	675	-455	70(	-27
##	#		*	-	*	3.4	* !	5.1	*		**		*	1.1	*	2-1	*	1-8	<b>2</b> • #	65.1	*	3.1	*	<b>-</b>	* -	****
OUTER E	<b>S</b>	TORQUE ftx1bs	197	-191	2090	-173	2206	-15	2321	-139	2436	-123	2550	-107.	2665	-92	2778	-78	2892	9-	3005	35	3119	-41	3232	-31
##	#		#	-	#	-	#	-	*	=	#	-	#	-	#	-	#	-	#	-	#	=	*	-	*	38-1
INNER	RPM	TORQUE ftx1bs	2218	289	2322	272-	2427	255	2532	239	2638	224	2744	209	2851	195	2957	182	3064	170	3172	158	3279	147	3387	138
* *	#		#	-	#	-	¥	-	#	-	#	-	#		*	-	#	-	*	-	#	-	#	-	*	- #
DUTER C. E. D	X P.M	TORQUE ftxlbs	-753,	1996	-798	1810.	-842	1628	-886.	1453	-930-	1284.	+-916-	1122	-1017	896	-1061	822	-1104	684	-1148	555	-1191	435	-1234	323
**	#		<b>#</b>	-	#	_	#	-	*	-	#	-	**	-	#	-	*	_	*	_	#	-	#	-	#	- *
<b>«</b> •		UE bs	847	3028.	-887.	2848-1	-927-	2673.	967	-2505-	-1007-	-2343.	-1048-	-2189.	-1088.	2043.	-1129.	-1905.	-1170	-1776.	-1211.	-1656.	-1252.	-1545-	-1293.	-1443.
INNER C & D	R P H	TORQUE	l ·	F-	1	-2	1	-2	ı	-5	7	-2	-1	-5	1	-2	-1	-1	-1	7	7	1	-1	-	-1	
v # #	#		#	-	*	-	#	-	*	-	#	-	#	-	*		#	-	*	-	*	-	*	-	#	- *
-AUG-85 OUTER B	RPM	TORQUE	-2742	594•	-2903	539	-3064.	485	-3225,	432.1	-3384.	382.	-3543	334.	-3702.	288	-3860.	244-	-4018-	204-	-4176.	165-	-4333	129.1	-4490	
* * 50	#		#	-	#	-	#	-	#	-	#	-	#	-	#	-	#	-	Ħ	-	#	-	#	-	#	- *
DATE:NO. Inner B	M M	TORQUE ftxlbs	-3082	106-	-3227	-847	-3372	-795	-3518	-145.	-3665	-697,	-3813.	-651	-3960-	-608	-4109	-567.	-4257	-528	-4406.	-493.	-4556.	-460.	-4705	-429
Z # #	#		#	-	#	-	Ħ	-	#	-	#	-	#	-	#	-	#	-	*	-	45	-	#	-	#	
OUTER MOTOR=A	RPM	TORQUE	8349	-178	8841	-162	9331	-145-1	9819.	-130-1	10305	-115.	10790	-100	11273.	-86-1	11755.#	-73.1	12236.	-61	12715.	1-05-	13194	-39.	13672.#	
* *	#		9385.#	270.1	4.	254-1	# •	1.6	#	224.1	# • 7	9.1	# •	196-1	*•0	182.1	2•#	170.1	#	159.1	# *	148.1	<b>*</b>	38.1	#	129.1
CONDITION : INNER : MOTOR=A	Α Q	TORQUE ftx1bs	938	7.2	9825.	25	10269	239	10714.	22	11161.#	209	11610.#	19.	12060.*	18	12512.#	17	12964.	15	13418.#	14	13873.	13	14328	12
	#		#	=	#	-	#	-	#	-	#	-	#	-	#	-	<b>#•0</b>	-	#	-	#	-	#	-	#	- #
MAXIMUM TURN	RPM	TORQUE ftx1bs	<b>4</b> 80*	5340	503.	5023	525	4715	248	4417.	571.*	4132.	594	3860.1	617	3602	940	3360.1	663	3132.	687	2921.1	710.	2725-1	733.	·2544.1
# # # X	#		#	=	44	-	#	-	*	-	#	-	#	-	#	-	#	-	#	-	#	-	#	-	#	6
LOADS AT : INNER : SPROK	<b>8</b>	TORQUE ftx1bs	427.#	-3520.	452.	-3192-1	478.	-2872.	502•≑	-2562	527	-2264	552	-1978	577	-1706-	602	-1449.1	626•≉	-1206.	651.	-979-	675	-766.	400	6
GEAR LD	HPH 4		28.5#	-	30.0#	-	31.5#	-	33.04		2#	l B	 <b>-</b> 56	i <u>.</u>	37.5#	-	39.0≉	-	40.5#	-	42.0	-	<b>43.</b> 5#	-	<b>40°5</b>	

GEAR LOADS AT MAXIMUM TURN CONDITION 97: RICK LEWIS: REVISION: 8-JUN-85 RUN DATE: 7-AUG-85:6 ************************************
INPUT DATA:
GROSS VEHICLE HEIGHT, tons = 19.5 TREAD MIDTH, in. = 92.5  MAXIMUM VELOCITY, mph = 45.0  TRACK LENGTH, in. = 150.0  ENGINE GROSS HP. = 500.0  TRACK PITCH, in. = 150.0  LOSS ENGINE HP. = 60.0  MUMBER OF SPROCKET TETH = 11  COFFICIENT OF DRAG = 1.00  FRONTAL AREA, ft.2 = 57.0  STEER SYS. GEAR RAILD = 99:1  PROP. SYS. GEAR RAILD = 21:1
**************************************
atsabbetsstatesessessessessessessessessessessessesse
# MAN
TORQUE TORQUE   ftxlbs ftxlbs
0.4-1228.4 1228.4 470.4 -470.4 323.4 -323.4 -161.4 161.4 0.4 0.4 8038.4-2456.4
-9783.  9783.  0.  487.  -487.  5089. -5089.  2446. -2446.  -815.  815. -7337.  7337.  214.  -175.  -912.  1126.  4309.
1.5¢ -68.¢ 116.¢ 504.¢-1096.¢ 1712.¢ 538.¢ -538.¢ -274.¢ -232.¢ 137.¢ 0.¢ 0.¢ 9190.¢-2808.¢ 0.¢ 1743.¢ -455.¢
9544.  -7.1 482.  -476.  5002. -5002.  2386. -2422.  -795.  807. -7158.  7267.  210.  -17
3.0# -46.# 142.# 1007.# -812.# 2044.# 547.# -547.# 566.# -184.# -283.# 92.# 0.# 9347.#-2856.# 0.# 1773.# -463.#
-12.1 477.1 -467.1 4932.1-4932.1 2341.1-2400.1 -780.1 800.1-7023.1 7200.1 207.1 -169.1 -884.1 1
4.5\$ -24.\$ 167.\$ 1511.\$ -529.\$ 2376.\$ 556.\$ -556.\$ 668.\$ -95.\$ -334.\$ 48.\$ 0.\$ 9507.\$-2905.\$ 0.\$ 1803.\$ -471.\$
1 -15.1 473.1
6.0# -1.# 193.# 2015.# -245.# 2707.# 565.# -765.# 770.# -6.# -385.# 3.# 0.# 0.# 9662.#-2952.# 0.# 1832.# -479.#
468.1 -454.  4818. -4818.  2273. -2358.  -758.  786. -6820.  7075.  202.  -165.  -864.  1
7.5# 23.# 216.# 2518.# 74.# 3004.# 561.# -561.# 863.# 93.# -45.# -46.# 0.# 9589.#-2930.# 0.# 1819.# -475.#
-7623.  8970.  68.  385.  -441.  4315. -4315.  2242. -1906.  -747.  635. -6727.  5717.  181.  -148.  -774.  955.  3654.
9.0# 59.# 227.# 3022.# 570.# 3124.# 489.# -489.# 237.# -454.# -119.# 0.# 8359.#-2554.# 0.# 1585.# -414.#
-7460.1 8766.1 66.1 377.1 -431.1 4220.1-4220.1 2192.1-1865.1 -731.1 622.1-6575.1 5595.1 177.1 -145.1 -757.1 934.1 3574.

| TORQUE| TORQ -736.1 908.1 3475.1 -713.1 880.1 3368.1 850-1 3253.1 785.1 3003.1 714-1 2732.1 818. | 3131. 527.1 2018.1 677.1 2591.1 # 0.# 1359.# 640.1 1189.4 793.4 602.1 750.1 132. 634.4 595.4 564.1 \$60. E d a \*• # \* -- 589-1 \* -663.1 \*.0 -636-1 \* \*.0 \*\*0 -548.1 -518.1 -488. \* -82.1 -427.1 -607.1 -576.1 604-1-6395-1 5438-1 172-1 -141-1 585.1-6207.1 5262.1 167.1 -137.1 63.1 342.1 -394.1 3842.1-3842.1 2003.1-1690.1 -668.1 563.1-6010.1 5069.1 161.1 -132.1 # # 0.4 7165.4-2189.4 6269.4-1916.4 5573.4-1703.4 5016.4-1533.4 540.1-5803.1 4859.1 155.1 -127.1 4560.4-1393.4 515-1-5589-| 4637-| 149-| -122-| 4180.4-1277.4 0.4 3858.4-1179.4 66.1 282.1 -336.1 3226.1-3226.1 1714.1-1387.1 -571.1 462.1-5141.1 4161.1 135.1 -111.1 3583.4-1095.4 67. | 265. | -320. | 3059. | -3059. | 1637. | -1304. | -546. | 435. | -4910. | 3912. | 128. | -105. | 0.# 3344.#-1022.# 1-66--958--93.1 -902.\* -116.1 -88--851. S. I \* # # 70-1 232-1 -289-1 2721-1-2721-1 1481-1-1134-1 -494-1 378-1-4443-1 3403-1 114-1 121. 198.1 -258.1 2383.1-2383.1 1327.1 -964.1 -442.1 321.1-3980.1 2892.1 100.1 142. 3135.\* 2950.\* 107.1 0.# 2786.# **#DUTER #INNER #STEER \*MOTOR** # RPH \* \* \*.0 \* \* \*.0 249.1 -305.1 2891.1-2891.1 1559.1-1219.1 -520.1 406.1-4677.1 3658.1 \*.0 65. 296.1 -351. 3388.1-3388.1 1789.1-1468.1 -596.1 489.1-5368.1 4403.1 \* 72-1 215-1 -274-1 2551-1-2551-1 1404-1-1049-1 -468-1 350-1-4211-1 3146-1 # RPM \*.0 \*•0 \*.0 \*\* \*\*0 \*.0 \* \* \* \*.0 .. \* # RPM u. 163.4 -163.4 1831.4 1607.4 -916.4 -804.4 # -190. -256.\* -318. -377.\* #\*969--489.4 -597. -543.# 1567.# 1299.# -784.# -649.# -701.\* -753. #INNER # RPR w 63.1 328.1 -380.1 3698.1-3698.1 1934.1-1620.1 -645.1 355.1 -407.1 3977.1-3977.1 2069.1-1754.1 -690.1 \* 64.1 367.1 -419.1 4104.1-4104.1 2132.1-1813.1 -711.1 -508.\* -366.1 3546.1-3546.1 1863.1-1546.1 -621.1 -478.\* 293.4 -293.4 1157.4 754.4 -578.4 978.4 -657.4 6547.# 3412.# 4591.# 226.# -226.# 1397.# 1087.# -698.# 210.4 -210.4 1481.4 1193.4 -741.4 8058.# 4446.# 5403.# 183.# -183.# 1654.# 1402.# -827.# 173.# -173.# 1742.# 1505.# -871.# -542.# -617.\* AT MAXIMUM TURN CONDITION
RUN DATE:No. 7-AUG-95:6
#OUTER # PROP #DUTER #INNER #DUTER
#SPROK #MOTOR # B # B # C # C # O # D # E # RPH uı \$12. 381.\* 4.969 267.# -267.# 1234.# 868.# # RPH -419.4 956.4 367.4 -367.4 1016.4 245.4 -245.4 1314.4 326.4 -326.4 1084.4 # RPR 196.4 -196.4 \* RPM 419.\* # RPM 4085. 3525.# 1060.# 3249.# 7051.4 3762.4 4856.4 5036.4 2312.4 3844.4 5683.\* 9066.4 5114.4 5966.4 3621.\* 4332. 3420. \$128. \* 801 4533.# 1919.# 6044.# 3055.# 1504.# \$540.# 2689.# 313.1 4106. 4782.\* # RPM 94.1 4029. 64. 69.1 73.1 7555. 8562.\* 239. 1-7251.1 8527.1 1-7016-1 8276-1 271. 1-6758.1 8013.1 289. 1-6479.1 7738.1 306.\* 7452.1 329. 1-5871.1 7157.1 349.# 1-5548.1 6855.1 21.04 298.# 370.# 6547.1 392.\* 1-4878.1 6236.1 414. 1-4537.1 5925.1 436. 1-4195.1 5614.1 4.88.4 1-3856.1 5307.1 # RPK 95. 15.04 188.4 18.04 245.4 19.5# 272.# 12.0# 128.# 13.54 159.4 25.54 376.# 24.0# 351.# GEAR LOADS A MAX #INNER & VEH #SPROK # # 8PH 10.5\* MPH

# 386.1 1478.1 354. | 1354. 294. | 1124. 420.1 1607.1 323. | 1236. 266. 1 1018. | TORQUE| TORQ 491.1 1878. 435.4 381.\* \* 366.\* 193. 4.914 453.4 414.\* 352. 340.\* \* RPH \*.0 \* \* -55.1 -287.1 \*.0 \* \* \* -156.1 -27.4 -140.1 \* -76.1 -398.1 -71.1 -368.1 \* -65.1 -340.1 -60.1 -313.1 \* \* -262.1 -46.1 -238.1 \* -216. -194.1 -175.1 Z P I -41.1 -37.1 -33.1 -30.1 # 0.4 2640.4 -807.4 -166. -697.\* +-999-\*\*669--50.1 -613.4 -589.4 -568.\* -547.# -528.4 -730.# I 67.1 37.1 93.1 61.1 86.1 80.1 73.1 0.\* 2090.# 0.\$ 2006.\$ 56.1 0.\* 1929.\* 50.1 0.# 1858.# 46.1 11.1 1730.\* 0.# 1672.# 33.1 ## 0.# 2508.# 0.# 2386.# 0.# 2280.# 0.\* 2181.\* 0.# 1791.# #INNER #DUTER #INNER #STEER # E & F & F #MDTOR \* 427.1 75. 1 182. 1 - 243. 1 2217. | - 2217. 1 1251. 1 - 880. 1 - 417. 1 293. | - 3754. 1 2640. 266.1-3533.1 2394.1 189.1-2914.1 1698.1 80.1 -151.1 1202.1-1202.1 793.1 -362.1 -264.1 121.1-2380.1 1087.1 905.1 239.1-3319.1 2154.1 80. 134. -200. 1746. -1746. 1037. -541. -346. 214. -3112. 1922. 165.1-2726.1 1484.1 92.| -162.| 1327.|-1327.| 849.| -427.| -283.| 142.|-2548.| 1280.| 134.1 575.1 \*.0 \*.0 \*.0 \*.0 \* \* \* 47.1-1817.1 \*.0 \*.0 \*. \* \*. 101-1-2223-1 82.1-2077.1 64.1-1941.1 +\*506-128.# -128.# 2285.# 2109.#-1142.#-1055.# 122.# -122.# 2376.# 2209.#-1188.#-1104.# 617.#12591.# 7388.# 8001.# 117.# -117.# 2469.# 2307.#-1234.#-1154.# 113.# -113.# 2561.# 2406.#-1281.#-1203.# 109.# -109.# 2654.# 2505.#-1327.#-1252.# -101.# 2840.# 2701.#-1420.#-1350.# -98.# 2933.# 2799.#-1466.#-1399.# 480.# 9569.# 5445.# 6251.# 154.# -154.# 1921.# 1709.# -960.# -854.# -955-# 548.#11080.# 6423.# 7119.# 133.# -133.# 2193.# 2010.#-1097.#-1005.# 105.# -105.# 2747.# 2603.#-1373.#-1301.# 77.1 165.1 -228.1 2055.1-2055.1 1178.1 -798.1 -393.1 -214. 1898. -1898. 1106. 1-718. 1-369. 1 82. 1 120. 1 - 187. 1 1599. 1 - 159. 1 971. 1 - 566. 1 - 324. 1 741.1 -302.1 -247.1 909.1 -495.1 -303.1 606.1 -142.1 -202.1 975.1 -975.1 692.1 -245.1 -231.1 147.¢ -147.¢ 2011.¢ 1810.¢-1006.¢ 140.\* -140.\* 2102.\* 1910.\*-1051.\* 873.1 -873.1 647.1 -192.1 -216.1 RUN DATE:No. 7-AUG-95:6 \*DUTER \*INNER \*DUTER \* C \* C \* n 178.1 -778.1 106.1 -174.1 1460.1-1460.1 -140.1 1085.1-1085.1 101.4 **98.** -113. 640.#13095.# 7708.# 8297.# 663.413598.4 8026.4 8594.4 687.#14102.# 8344.# 8892.# 56.1 -130.1 9190.\* 46.1 -121.1 503.410073.4 5772.4 6539.4 525.410576.4 6099.4 6828.4 571.411584.4 6746.4 7412.4 594.#12087.# 7067.# 7706.# 733.#15109.# 8978.# 9489.# AT MAXIMUM TURN CONDITION +OUTER + PROP +OUTER + INNER + SPROK + MOTOR + 8 + 8 # RPH # RPH # RPH # RPH 68.1 36.1 8661.\* 150.1 84.1 89.1 92.1 93.1 87.1 78.1 90.1 710.414606.4 1.58 1-1978.1 3635.1 1-1206.1 2964.1 -767.1 2588.1 1-3192.1 4711.1 1-2264.1 3886.1 |-1449.| 3173.| -979.1 2769.1 1-3520-1 5005-1 1-2562-1 4150-1 1-1706. | 3397.1 4425.1 577. 675.\* 4.27.4 1-2872-1 \$27. 36.04 552.4 **602.** 626.# 651.# 31.54 478.4 \$05. 452.4 GEAR LDADS I MAX #INNER I VEH #SPROK I 37.54 33.04 39.0\* **60.5**\* 45.0\* 13.54 \$0.59 30.0# 34.54 H

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GEAR LOADS AT MAXIMUM TURN CONDITION BY: RICK LEWIS: REVISION: 16-JUL-85 Run Date: 7-Aug-85; ************************************
INPUT DATA:
GROSS VEHICLE WEIGHT, tons * 19.5 TREAD WIDTH, in. * 92.5 MAXIMUM VELOCITY, mph * 45.0 TRACK LENGTH, in. * 150.0 COEFFICIENT OF FRICTION * 0.70 ENGINE GROSS HP. * 500.0 TRACK PITCH, in. * 6.03 MAXIMUM ACCELERATION, gs =0.50 LOSS ENGINE HP. * 60.0 NUMBER OF SPROCKET TEETH * 11 COEFICIENT OF DRAG * 1.00 FRONTAL AREA, ft^2 * 57.0 ROLLING RESISTANCE, ib per ton* 100.0
Efficiency data for Homopolar motor
88888888888888888888888888888888888888
H RPH + RPH + RPH + RPH + RPH + RPH +
0.04 -89.4 89.4 -1861.4 1862.4 21274 -677.4 677.4 891.4 -891.4 0.4 0.4 -245.4 245.4 323.4 -323.4 0.4 0.4
1-9783-19783-1 467-1 -467-1 136-1 -136-1-1284-1 1284-1 2928-1-2928-1 2260-1-2260-1-3545-1 3545-1-16163+ 6239-1-6239-1
1.5# -61.# 109.# -1278.# 2279.# 1461# -2604# -465.# 829.# 612.#-1090.# 0.# 0.# -168.# 300.# 222.# -395.# 0.# 0.#
19581.1 462.1 -462.1 135.1 -135.1-1271.1 1271.1 2
*
-7585.19301.1 444.1 -362.1 1
- *-
-7559. 9277.  443.  -361.  105.  -129.  -992.  1218.  2262. -2777.  1746. -2143. -2739.  3361. 12488. -15326# 4820. -5916.
•
1-7535. 9255.  442.  -360.  105.  -129.  -989.  1215.  2255. -2770.  1741. -2138. -2730.  3353. 12449. -152914 4805. -5902.
7.5\$ 51.* 188.* 1067.* 3936.* -12194 -44984 388.* 1431.* -510.*-1883.* 0.* 141.* 519.* -185.* -682.* 0.* 0.*
-356.1 104.1 -128
.0
1 432.1 -349.1 102.1 -126.1 -9

77. -102. -128. 960. 1661. -2189. 1282. -1689. -2010. 2649. 9166. -12081 3538. -4663. 73. -97. -685. 917. 1561. 1-2092. 1205. 1-1615. 1-1890. 12532. 8618. 1-115454 3326. 1-4456. P -93. | -640. | 874. | 1460. | -1993. | 1127. | -1538. | -1767. | 2412. | 8059. | -11000# 3111. | -4246. | 63. -88. -596. 830. 1358. 1-1893. 11048. 1-1462. 1-1644. 2292. 17495. 1-10451 2893. 1-4034. 1 969.1-1385.1-1520.1 2172.1 6931.1 -9903# 2675.1-3822.1 -79.1 -506.1 744.1 1154.1-1695.1 891.1-1309.1-1397.1 2052.1 6370.1 -9358# 2459.1-3612.1 | TORQUE|TORQU|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|TORQUE|T 425.| -342.| 100.| -124.| -942.| 1169.| 2147.|-2664.| 1657.|-2057.|-2599.| 3225.|11850.|-147074 4574.|-5676.| 98.| -122.| -921.| 1149.| 2100.|-2619.| 1621.|-2022.|-2542.| 3170.|11592.|-14456# 4474.|-5580.| 94.] -118.[ -887.] 1115.[ 2023.[-2543.] 1561.[-1963.[-2449.] 3079.[11165.[-14038# 4309.[-5418.] 90. -114. -851. 1080. 1939. -2461. 1497. -1900. -2348. 2980. 110705. -135864 4132. -5244. 86.| -110.| -812.| 1041.| 1851.|-2374.| 1428.|-1833.|-2240.| 2874.|10215.|-13106\* 3943.|-5059.| 82.| -106.| -771.| 1001.| 1757.|-2283.| 1357.|-1762.|-2127.| 2764.| 9708.|-12603# 3744.|-4864.| #OUTER # RPR ٯ \* \* \*\* \* \*\* \* \* \* \* .. \* \* #INNER #OUTER #INNER #OUTER #INNER #OUTER #INNER #OUTER #INNER 2 P E ڡ \* # 0.# 281.# 641.# -370.# -844.# 0.# 354.# 701.# -465.# -922.# 748.4 -577.4 -984.4 0.4 520.4 798.4 -684.4-1050.4 0.4 599.4 951.4 -788.4-1120.4 907.4 -888.4-1193.4 0.# 750.# 964.# -987.#-1268.# 0.\* 823.\* 1022.\*-1084.\*-1345.\* 0.# 896.# 1081.#-1179.#-1423.# 968.\* 1141.\*-1273.\*-1502.\* 0.\* 1039.\* 1202.\*-1367.\*-1582.\* 0.\* 1109.# 1264.#-1459.#-1563.# # RPI u # E P H u # \* # RPH w 0.# 675.# 0.4 439.4 # # RPM w \*.0 # \* RPE 0 \*.0 \* \*\*0 \* \* \* \*. \*• \*.0 \*.0 \* \*.0 # HON \* 0 -83.1 -551.1 787.1 1256.1-1794.1 6801.\* 8207.\* -7772\* -9379\* 2473.\* 2984.\*-3254.\*-3927.\* # 2136.# 4868.# -2440# -5563# 777.# 1770.#-1022.#-2329.# 976.# 1935.#-1284.t-2546.# -6505# -8359# 2070.# 2660.#-2723.#-3500.# 3318.4-3772.4-4366.# -5192# -7384# 1652.# 2350.#-2174.#-3092.# 5124.\* 6882.\* -5856# -7865# 1863.# 2503.#-2452.#-3293.# -7143# -8865# 2273.# 2821.#-2991.#-3712.# 7345.# 8663.# -8394# -9901# 2671.# 3150.#-3514.#-4145.# -9621#-10960# 3061.# 3488.#-4028.#-4589.# -3805# -6485# 1211.# 2063.#-1593.#-2715.# 3948.# 6058.# -4511# -6922# 1436.# 2203.#-1889.#-2898.# # RPM ب \* 7-AUG-85:4 # RPH ب \* MAX &INNER &DUTER INNER &DUTER BINNER &DUTER BUNER BUN # RPM -9010¢-10428\* 2867.\* # RPS -3066# -6080# # RPM 58.1 68.1 54.1 # RPE 8419. # 9591. # 418.1 -335.1 379.1 -295.1 5692.# 7315.# 349-1 -265-1 334.1 -249.1 318-1 -233-1 302.1 -217.1 286-1 -200.1 270.1 -184.1 3330.# 5674.# 393.1 -309.1 4.787.4 7884.\* 9125.\* 2683.4 5321.4 406.1 -323.1 4544.# 6462.# 364-1 -280-1 RPM # RPK MPH # RPM # RPM # 10.5# 102.# 232.# 1-7016.18750.1 159.# 271.# 15.04 188.# 289.# 16.5# 217.# 308.# 245.# 329.# 19.54 272.4 349.4 1-5548.17312.1 21.04 298.# 370.# 22.5# 325.# 392.# 1-4878.16658.1 24.04 351.# 414.# 1-4537.16326.1 25.54 376.4 436.4 1-4195-15994-1 27.0\* 402.\* 458.\* 1-3856.15665.1 1-7172-18902-1 12.0# 128.# 254.# 1-6183. | 7933. | 1-5871.17628.1 1-6758-18497-1 1-6479.18224.1 1-5216.16988. 13.5# 18.0\*

JTER #	R P	TORQUE	**0	3405.1	*.0	3203.1	4.0	3006.1	*.0	1.718	***	635.1	**0	461.1	*	2297.1	**0	2142.1	**0	944.1	**0	728.1	0.#	521.1	*•0	
ER #001	*	1 = =	*	45.1-	**0	35.1-	**	31.1-3	**	34.1-2		44.1-2	**	62.1-2	*:	88.1-2	*	24.1-2		716.1-1	*.0	90.1-1	**0	273.1-1	**	
#INNE	# #	ORQUE   TORQUE txlbs   ftxlbs	*	22 *2	*	98# 20	#	=	*	8# 15	*	91 #9	*	12	*.	51# 10	*	6 *0	*	1	*	* *9	*	7 +1	*	!
*OUTER * F	5 5 1	TORQUE! ftx1bs	-1764.	-8822#	-1826.	-8291	-1908.	-77894	-1991	-729	-2014	-682	215	-6377¢	2241	-5951	2325	-555(	-2407.	-5036#	-2489.	-4476	-2571.	-3941	-2652.	
NNER #	R M	TORQUE!	552.	1.918	643.#	5274.1	*	4745.1	*	4233.1	915.	3740.1	2005.*-	3269.1	2095.#-	2819.1	2184.#-	1.468	2276.4-	855.1	2368.#-	1269.1	4.654	1.901	551.4-	
* *	#	168   ft	325.4-1	5.1.5	88.4-1	ı	\$0.4-1734	-	3.4-1825	1	Ţ.	-	*	-	3. *-2(	-	#	1.1 23	*	1 -		-	-#-	-	6.#-2	!
*OUTER	*	TORQUE		193	13	1820.1	=	1708	151	1600.1	1576	1497	1640	1399	170	1305	1767	1217	1830	1105.	18	982	1954	864	201	
NNER 8	M W	TORQUE	1179.*	-1276.1	1249.	157.1	318.*	041.1	1387.#	-928.1	456.4	-820.1	\$24.*	-717.1	1592.	-618.1	\$.099	525.1	729.*	-407.1	1799.#	-278.1	**698	155.1	939.4	
# #	*	UE I TO	0.4.1	-	0.4 1	0.1-11	0.* 1	9-1-1041	0.4 1	21.1	0.* 1	! _	0.* 1	l _	0.* 1	-	*	! _	0.* 1	-	0.# 1	- 1-9	0.* 1	1-1-1	0.# 1	١.
#OUTER # D	# #	TORQUE	*	-1-123	*	.1-1160	*	664.1-108	*	592.1-102	*	1 -955-1	*	1 -892.		1 -832		1 -776.		1 -704	•	-62		1 -551		
#INNER # D	M P	ORQUE	0	813.	•	737.	0	666.	•	592.	**0	523.1	•••	457.1	0.	394.1	**	335.1	**0	259.1	•	177.1	**0	99.	0.*	-
~	*	TORQUE TORQUE ftxlbs [ftxlbs	813.*	98.1	5040.	503.1	67.*	11.1	95.#	22.1	25.*	37.1	55.#	55.1	86.*	78.1	17.*	1.90	4.5.4	-912.1	**01	11.1	95.	1.4.1	20.#	
.8514 : #0UTE	# RP #		*-	.1-159	5.4-50		. *-5267	.1-1411.	36.4-549	.1-1322	.*-572	.1-1237	*595	-1-115	. 4-61	-1-1078	#	34.1-1006.	.*-6645.	-	.4-6870.	.1 -811	.*-7095.	.1 -11	.4-732	
7-AUG-8 *INNER * C	2 A	TORQUE	-4282	105	-453	955	-4786	860	20	767	-5286	678	#-5534	265	-5782	511	9	*	-6281	336	-6534	230	-6788	128	#-7041	:
#OUTER *	*	TORQUE!	558.	701.1	3830.*	1.659	003.*	619.1	176.*-	580.1	351.*	542.1	526.	507.1	*.101	473.1	877.4-	441.1	5050.*-	*00	5221.	356.1	5392.4-	313.1	564.	
	#	RQUE TORQUE KIDS   ftx1bs	54.# 3	62.1	*		***	7.1	* *	1.9	7.8 4	7.1	4 # 9	-	* ***	-;	82.* 4	1.0	3.*	47.1	66.# 5	1.10	59.* 5	6.1	51.* 5	-
A BERNER	# RP	2	74 325	94- 1-	* 3446.	1 -41	# 3638.	1 -377.	5# 3828	1 -336.	* 4017	1 -297	3# 4206	1 -260.	* 439	1 -22	88 458	.1 -190	* 417	-1-	49	.1 -10	<b>*</b> 51		<b>*</b> 53	-
#OUTER # A	Z 0	TXIDS	1149	-76	12037*	-10.	12580#	-99-	312	-62.	13673#	-58.	422	-54.1	14775#	-50	1532	-4.7	15871*	-42.	-16408#	-38.	-16947	-33.	17485	1,00
	*	ORQUE!T txlbs/f	-\$672	49.1	0831#-	-:	4324-1	1.04	-12029#-1	36.1	-#5797	32.1	3219#-1	28.1	38104-	24.1	401#-	1.02	-*200	16.1	*109	11.1	212#	6.1	818#-	-
	# RPH	==	. *-10	-	7	-	. 4-11	-		-	7	-	7	-	7		. 1-14	_	-15	-	-15	-	-16	-	. 4-16	-
N COND #OUTER #HOTOR	# RPM	TORQUE	950.#10060.#	255.1 -168.	10533	240.1 -152.	*11008.	225.1 -137.1	11485	-122	11965	-106	12446	-94.1	12928	-81.1	13412	1-69-	13887	-54.1	57.414358.	-37:1	14829	-20-1	15300	-
I TURN INER 4	M M	10 UE	8950.#10060.#	255.1	9476.#10533.#	240.1	003.	225.1	\$26.	211.1 -122.	047.*	197.1 -108.	\$67.	184.1	12085.#12928.#	172.1	**109	160.1	13127.413887.	146.1	4.159	1.621	14186.*1482	114.1	716.*	400
**DUTER** INNER **DUTER ** **SPROK** MOTOR **NOTOR **				_	- 1	<b>-</b>	. 10003.		. 10	!	527.4 571.4 11047.411965.4	1	. 11	1-1978. 3860.  184.	. 12	-	. 12	-	627.4 663.4 13127.413887.4	-	652.4 685.4 13657.414358.4		*	1	730.* 14716.*15300.*	- -
AT MA #DUTE #SPRO	# RPM #	11089	084	1-3520-15340-1	<b>*</b> 503	1-3192-15023-1	\$ 525	1-2872.14715.1	# 548	1-2562.14417.1	<b>\$ 571</b>	1-2264-14132-1	* 594	13860	* 617	1-1706.13602.1	0+9 *	1-1449-13360-1	<b>*</b> 663	1-1123.13049.1	<b>* 685</b>	-768.12710.1	* 708.	-427-12386-1	# 730	-
DADS	# PD #	ORQUE	427.	3520.	452.	3192.	478.	2872.	502.	2562.		2264.	552.	1978.	577.	1706.	602.	1449.	627.	1123.	652.	-768.	677.	-427.	702	-102
GEAR LOADS AT MAXIMUM TUR Max #Inner #Duter# Inner Veh #Sprok #Sprok# Motor	# Hd#	)	28.5* 427.* 480.*	_	30.0¢ 452.¢ 503.¢ 9478.¢10533.¢	_	31.5¢ 478.¢ 525.¢ 10003.¢11008.¢	_	33.04 502.4 548.4 10526.411485.4	<u> </u>	34.54	!	36.0¢ 552.¢ 594.¢ 11567.¢12446.¢	_	37.5¢ 577.¢ 617.¢ 12085.¢12928.¢	_	39.0¢ 602.¢ 640.¢ 12601.¢13412.¢	1-1449.[3360.] 160.] -69.	40.5# 627.# 663.#	_	42.0# 652.	_	43.5#	-	45.0# 702.# 730.# 14716.#15300.#	
OFF	*	1	Ñ		m i	i	m i		m i	i	ň	i	ř		ñ	i	m		¥ ;		· •	i	<b>4</b>		÷	

BY: RICK LEWIS; GEAR LOADS AT MAXIMUM TURN CONDITION

REVISION: 16-JUL-85 RUN DATE: 20-AUG-85:112

INPUT DATA:

NUMBER OF SPROCKET TEETH = 11 ROLLING RESISTANCE, 1b per ton= 100.0 = 183.1 = 109.8 TRACK PITCH, in. = 7.63 TREAD WIDTH, in. " TRACK LENGTH, in. 40.0 MAXIMUM VELOCITY, mph = 45.0 GROSS VEHICLE WEIGHT, tons = FRONTAL AREA, ft^2 = 68.3 ENGINE GROSS HP. =1000.0 LDSS ENGINE HP. = 120.0

GRADE, \$\ = 0.0 COEFFICIENT OF FRICTION \( \in 0.70 MAXIMUM ACCELERATION, 95 =0.50 COEFICIENT OF DRAG = 1.00

TWIN DRIVE MOTOR SET-UP ALTERNATIVE I # Efficiency data for Westinghouse induction motor by Craig Joseph 10-MAY-85

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**************************************	########## INNER *	######################################	******* OUTER * SPROK *	# Z	############ INNER # MOTOR=A #	# <b>T</b>	÷÷÷÷÷÷÷÷÷÷÷÷÷÷÷÷÷÷÷÷÷÷÷÷÷÷÷÷÷÷÷÷÷÷÷÷÷÷	∜ Z ∳ ₩ *	WATER THE B	*****	* * * *	####### INNER C & D	* * * * * * * *	******* OUTER C & D	P # # # # #	######################################	* F F # # E # #	OUTER E	**	# INNER #	# DUTER
# Hd		*	RPM	#	RPR *	#	RPM	ű.	RPM #	20 A	#	RPM	#	RPH	#	RPM	#	R P R	*	RPH #	RPR
	TORQUE ftxlbs	1 = 1	TORQUE		TORQUE		TORQUE   ftx1bs	122	orque 1 txlbs 1	TORQUE ftx1bs	20E	TORQUE ftx1bs		TORQUE ftxlbs	<b></b> -	TORQUE ftx16s		TORQUE ftx1bs		TORQUE! ftlbs!	TORQUE ftlbs
#	-71.*	45	+ • • • • • • • • • • • • • • • • • • •	#	1759.#	#	1758.		-457.		4.57.#		-126.#	.125.	#	329.#	*	-329.	*	-71.*	71.
В-	-25777.1	_	25777.1	_	1306.1	-	-1305.1		-4349-1		4349.1	-14616.1	6.1	14616-1	<b>1</b> -5	1395.	-	-1395.		-22829-1	22826.
63	<b>**6</b> *-	#	86.*	#	2134.#	#	1201.		-554.#		312.#		-152.*	80	86.#	399.*	*	-224.	#	#-64-	86.
<b>\</b> -	-25450-1	-	25450.1	-	1289.1	_	-1289.1	į	-4594-1		4294-1	-14431.	1.1	14431-1	1.1	1377-1	<u>-</u>	-1377.1		-22540.1	22538.
3.0#	10.*	#	<b>**99</b>	#	1627.	#	240-#		-422.	24	-62.		-116.\$	-1	-17.*	304.*	#	¢2°¢	*	10.#	.99
-	-19796-1	_	24248-1	-	1228-1	_	-1002-1	i !	-4091-1		3340.1	-13749-1	1-6	11225-1	5.1	1312.	<u>.</u>	-1011	1	-1071.1 -17024.1	21982.
4.54	17.*	*	#*96	#	2383.‡	#	417.		-619-	Ĭ	-108.*		-170.4		-30.*	**9 <b>*</b> *	*	78.*	#	17.*	.96
-	-19710-1	_	24164.	_	1224.	_	1-866-	i ! !	-4077.1		3325.1	-13701.	11.1	11176.	1.9	1308.	-	-1067.1		-16947.	21908.
*0 <b>*</b> 9	25.*	#	126.*	#	3118.	#	615.	_	-810-		-160.		-223.#		****	583.	*	115.	#	25.	126.
-	-19634-1	-	24091-1	_	1220-1	_	-994.1		-+064-1	 	3313.	-13660.1	50.1	11133.	3.1	1304-1	<del>-</del>	-1063.1		-16880-1	21844.
7.5	39.*	#	150.	#	3705.	45	962.		-962.#		-250.*		-264.#		#*69-	\$95°	#	180.*	*	39.#	150.
-	-19405-1	-	23865.1	_	1209-	_	-982.1	!	-4026-	_	3274.1	-13532.	32.1	11003.	3.1	1292.	-	-1050-1		-16676.	21644.
#0*6	57.*	#	169.	#	4184.	#	1416.4	_	-1086.		-368.	1	-299.*	!	-101.#	78.	782.#	265.#	#	57.	169-
-	-19057-	_	23523.1	-	1191.	-	1-596-	   	-3969-		3215-1	-13338.	38-1	10806.1	1-9	1273.	3.1	-1031	<u>.</u>	-1031.  -16367.	21341.

GEAR L Max # Veh #	LOADS AT MA) INNER # SPROK #	MAXIMUM TURN (	CONDITION F INNER #	RUN OUTER # MOTOR=A #	DATE:No. 2. INNER # B #	20-AUG-85;112 0UTER # B #	INNER #	0UTER #	INNER	# DUTER # E	# INNER	# 0UTER	æ
# Hd#	A H	R P H	A A	RP #	RPH #	RPM #	RPH #	RPM	RPM	# RPM	X d	# RPM	_
	TORQUE   ftxlbs	TORQUE	TORQUE   ftxlbs	TORQUE   ftxlbs	TORQUE 1 ftxlbs 1	TORQUE   ftxlbs	TORQUE   ftxlbs	TORQUE   ftxlbs	TORQUE ftx1bs	TORQUE ftx1bs	TORQUE	El TORQUE	UE
10.5	77.	188.	4635.#	1898.	-1204.	+*667-	-331.4	-135.#	# 998	355	77	**	188
-	-18572.1	23143.1	1172.1	-945.1	-3905-1	3150.1	-13123.1	10587.1	1253.	-1011.1	1.1 -16026.1	-I 21006	.906
12.0#	97.4	205.#	5072.*	2395.#	-1317.#	-622.#	-362.*	-171.*	\$*. 8**	448.	3. <b>*</b> 97	*	205-
-	-18254.1	22732.1	1151.1	-924.1	-3835.1	3080.1	-12889.1	10350.1	1230.1	-988.1	1.1 -15655.	-1 20642	142.
13.5#	117.*	223.#	5515.#	2885.*	-1432.#	+-671-	-394•#	-206.	1031.*	539.	117.	4	223-
-	-17839.1	22324.1	1131.1	-903.1	-3766.1	3010.1	-12658.1	10115.1	1208-	-996-	-15286-	-1 20282	:82.
15.0#	140.	237.	5867.	3467.4	-1524.#	<b>**006-</b>	-419.	-247.	1097.	648	140*		237.
-	-17151.1	21645.1	1096-1	-863.	-3652.1	2894.1	-12273.1	9725.1	11711	-928*	1.1 -14676.1	13	682.
16.5≉	164.*	252.	6224.#	<b>4045</b> *	-1516.#	-1050-#	+***	-289.#	1163.#	, 756.¢	164.4		252-
-	-16372.1	20875.1	1057.1	-829.1	-3522.1	2762.1	-11836.1	9283.1	1130.1	-886-1	-1 -13985	-	9001.
	186.#	267.	#*0099	<b>4</b> *009 <b>*</b>	-1714.#	-1195.#	-471.*	-328.	1234.#	860-	186.	ļ	267.
B-6	-15554.	20067-1	1016.1	-787-1	-3386.1	2624.1	-11378.1	8819.1	1086-1	-842.	-13260-1	.1 18287	87.
4	208.	283.*	<b>**</b> 0669	5144.	-1815.#	-1336.	<b>**66*</b> -	-367.	1307.	961.*	* 208*		283.
-	-14705.1	19229.	974.1	-745.1	-3244.1	2481.1	-10903-1	8338.1	1041.1	-196.1	1.1 -12507	•1 17546	-949
21.0*	230.	<b>299.</b> *	4*06€2	5676.	-1919.	-1474.	-527.¢	-402°¢	1381.	1001	230	#	299.
-	-13834.1	18369.1	930.1	-700.1	1.6606-	2334.1	-10415.1	7844-1	1*466	-749.	.1 -11733.	-	6786.
22.54	251.#	316.	7800.*	\$500°	-2026-	-1610.	-557.	-443.	1458.	1159.	251	#	316.
-	-12946-1	17494.	886.1	-655.	-2951.1	2184-1	-9119-1	7341.1	947.1	-701-1	.1 -10946.	.1 1501	13.
24.0#	272.#	333.#	8217.	6717.*	-2134.#	-1744.#	-586.	#*614-	1536.#	1256	.* 272	*	33.
-	-12051.1	16612.1	841.1	-610-1	-2803-1	2033.1	-9419.1	6833.1	899.1	-652	-1 -10151	• 15	233.
25.5	292•≄	350.	8639.	7227.	-2244.#	-1877.	-617.	-516.	1615.#	1351	.* 292	#	350.
-	-11155.1	15731.1	1.197	-565.1	-2654.1	1882.1	-8919-1	6325-1	851.1	-604	-1 -9356	<del>-</del>	4454.
27.0*	313.	367.	\$.1906	7733.#	-2355.#	-2008.	+-647.	-552.*	1695.	1446.*	* 313.*		367.
-	-10264.1	14856.	752-1	-520-1	-2506-1	1732.	-8423-1	5820-1	804-1	-556	-1 -8566.	• 1 13681	81.
						(						(	

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GEAR L Max # Veh #	LOADS AT MAX # INNER #	MAXIMUM TURN (	CONDITION : INNER # : MOTOR=A #	RUN OUTER # NOTOR=A #	DATE:NO. Inner B	20-AUG-85:11 * OUTER *	174	INNER #	: 0UTER : C & D	# #	INNER #	OUTER E	# INNE	##	OUTER F
WPH #	RPM #	A A	RPM #	RPM	RPM	RPR	*	RPM *	RPM	*	RPM	RPM	# RPM	#	RPM
	TORQUE   ftxlbs	TORQUE I ftxlbs I	TORQUE   ftxlbs	TORQUE   ftxlbs	TORQUE ftxlbs	TORQUE   ftxlbs		TORQUE   ftxlbs	TORQUE ftx1bs	1 TOI	TORQUE   ftxlbs	TORQUE	1 TO	TORQUE! 7	TORQUE ftlbs
28.5#	333°#	384.4	\$*8676	8235.	-2467.	-2139.*	<b>**</b> •6	-678-	-588	#	1775.#	1539.	#	333.#	384.
-	-9386-	13994.1	1.607	-475.1	-2361-	1584.]	7	-7935.1	5322	-	757.1	-508	-	7786.1	12919.
30.0⊄	353•≉	405-¢	\$633*	8733.4	-2580.	-2268.	# *	<b>**60</b> L-	-623.	#	1857.	1632	*	353.#	402.
- -	-3526-1	13150-1	1.999	-432.1	-2219.	1438.1		-7456-1	4834-1	-	712.1	-461.1	'	7022.1	12174.
31.5*	373.≉	420-#	10371.	9229.	-2693.	r -2397.*	7.*	÷-04L-	<b>**659</b> -	#	1939.#	1725.	#	373.#	420.
-	-7688.1	12330.1	625.1	1*68E-	-2080-	1297.1	7.1	-6991.1	4359	-	667.1	-416	-	6278-1	11450.
33.0	393•≄	<b>438°</b> ‡	10812.*	9721.*	-2808-	* -2525.*	5.#	-772.*	<b>769-</b>	#	2021.#	1817	#	393.#	438.
-	-6877-1	11539.	584.1	-348.	-1947.	1160.1		-6542.1	3900.	_	625.1	-372	-	5558.1	10751.
,	413.4	455.	11255.	10212.*	-2923.	<b>* -2652.</b>	<b>*</b>	-803.	-729.	#	2104.*	1909	*	<b>413.</b> #	455.
В	1-8609-	10778-1	1-9+5	1.606-	-1818-	1029.	9.1	-6111.1	3457	-	583.1	-330	-	4865.1	10081.
-65	<b>433</b> °#	413.#	11700.*	10700.	-3038-	<b>*</b> -2779.*	<b>**</b> 6	-835•	-164	#	2187.#	2000	#	433.≉	473.
	-5352.	10053.1	209-1	-271.1	-1696-		903.1	-5700.1	3035.	_	544.	-290-1		-4202-1	9441.
*	453°#	492.4	12147.*	11187.	-3154.	-2905-	5.*	+-867.	-798	*	2271.*	2091	#	453.#	492.
-	-4643.	9365.1	474.1	-235.	-1580-1	18	3.1	-5310.1	2632	-	507.1	-251	-1-3	572.1	8834.
39.0#	472.4	510.4	12595.#	11672.	-3271.	* -3031	*	\$°6.68-	-833.	*	2354.*	2182	#	472.#	510.
-	-3972.1	8717.1	442.1	-201.1	-1471.	1 670	1.0	-4942.1	2252.	_	472-1	-215	.1 -2	975.1	8262.
<b>*6.0</b>	492•≄	528.#	13044.*	12156.*	-3388.	t -3157.#	7.*	-931.*	-868*	#	2438-#	2272	#	492.≉	528.
-	-3340-1	8108.1	411-1	-169.	-1368	99	563.1	-4597.	1894-1	_	439.1	-181	-	2413.1	1726.
42.0#	511.	546.4	13495.	12538.	-3505.	-3282.	2.*	-963.	±-905-	*	2523.*	2362	#	511.*	546.
-	-2749.1	7541.1	382.	-139.1	-1272.	94 1	464.1	-4276-	1558.	_	408-1	-149	-	1886.1	7226.
43.5	531.*	564.	13947.*	13120.	-3622.	+-3407.	7.#	<b>**</b> 966-	# <del>-</del> 936-#	#	2607.	2452	#	531.*	564.
-	-2197.1	7015.1	355.	-1111-	-1183.	37.	371.1	-3977-	1246.	_	380.1	-119	-	1395.1	6763.
45.04	550.	583.4	14400**	13600.#	-3740.	-3532°#	2.#	-1028.*	+-111.	#	2692.#	2542.*	#	550.#	583.
-	-1686-1	6529.1	331.1	-85.1	-1102-1		284.1	-3702.1	956-1	_	353.	-91	- 1-16	1.046	6336.
***** End	tespasses P	*****	数数数数数数数数数数数数数数数数数数数数数数数数数数数数数数数数数数数数数	***	**	**	*	**	***	# # # #	*	***	*	*	# # # #

TRUED DATA:   CRADE: T.   CRETICIENT OF PRI   CRETICIENT		**********		IUN BY: KICK LEWIS: REVISION: 8-JUN-85 RUN DATE: 15-JUN-85 ####################################	. LEWIS:	RUN DE	ISION: 8-J DATE: 15- cattatata	8-JUN-85 15-AUG-85:113 ******	# #		***	**************	***	******
GROSS VEHICLE WEIGHT, tons = HAXIMUM VELOCITY, mph = 45.0 LOSS ENGINE HP. = 120.0 LOSS ENGINE HP. = 120.0 LOSS ENGINE HP. = 120.0  FRONTAL AREA ft.2 = 68.3 STEER MOTOR EFF.X = 92.  TORONE FF.X = 92.  TORONE FF.X = 92.  TORONE FF.X = 92.  TORONE FF.X = 68.3  TORONE FF.X = 92.  TORONE FF.X = 93.  TO	INPUT DATA:													
Efficiency data for Mestinghou by Craig Joseph 10-MAY-8 ** ** ** ** ** ** ** ** ** ** ** ** **	OSS VEHICLE WEIGH! XIMUM VELOCITY, BI GINE GROSS HP. #10 SS ENGINE HP. # 12 ONTAL AREA, #22 #	6 0 8	0.0	32552	in. = 10 in. = 1 in. = 7 in. = 7 in. = 7 in. = 7 in. = 1 in. =	u 0-	100		wort.		* 0.70  s			
# SPROK #SPROK #MOTOR # B # # SPROK #MOTOR # B # # # RPH # R	ficiency data for by Craig Josep	reservated Westinghou oh 10-MAY-6		:*************************************	**************************************	******* FERNATIV JPULSION	######################################	**************************************	**************************************	***	*	***	***	
# RPH	######################################	**************************************		Patestetet Duter * Inner # C # C #	**************************************	####### WER #OL D #	####### JTER #IN E #	######### NER #OUTER E # F	######################################	ISTEER #	* * * * * * T	**	***	***
ftx bs  ftx  bs  ftx  bs  ftx  bs  ftx  bs  ftx  bs  ftx  bs  ftx  bs  ftx  bs  ftx  bs  ftx  bs  ftx  bs  ftx  bs  ftx  bs  ftx  bs  ftx  bs  ftx  bs  ftx  bs  ftx  bs  ftx  bs  ftx  bs  ftx  bs  ftx  bs  ftx  bs  ftx  bs  ftx  bs  ftx  bs  ftx  bs  ftx  bs  ftx  bs  ftx  bs  ftx  bs  ftx  bs  ftx  bs  ftx  bs  ftx  bs  ftx  ftx  ftx  ftx  ftx  ftx  ftx  ft	RPM + RPM + RPM	# RPM #	RPH #	# EGE # EGE	# # #	# W.d.	# Hd~	# # # # # # # # # # # # # # # # # # #	# Hear	# Ed	# H	# Hd	1 :	E .
-05.# 65.# 0.4 -962.# 982.# 376.# -376.# 258.# -258.# -129.# 129.# 0.# 0.# 0.# -257731 257721 01 12831 -12831 134051-134051 64431 -64431 -21471 21471-193291 193291 -257731 257721 01 12831 -12831 134051-134051 64431 -64431 -21471 21471-193291 193291 -25.# 90.# 398.# -834.# 1321.# 413.# -413.# 440.# -138.# -220.# 69.# 0.# 0.# 0.# -25.# 110.# 797.# -613.# 1587.# 421.# -421.# 440.# -138.# -220.# 69.# 0.# 0.# 0.# -251.681 245381 -311 12501 -12241 129271 61341 -62921 -20441 20971-184041 188761 -17.# 130.# 1195.# -392.# 4853.# 430.# -430.# 522.# -68.# -261.# 34.# 0.# 0.# 0.# -248901 241021 -391 12361 -12031 127411-127411 60251 -62221 -20081 20741-180771 186671 1.# 150.# 1593.# -163.# 2110.# 435.# -435.# 601.# 3.# -300.# -2.# 0.# 0.# 0.# -201611 237171 17881 151211 -201611 237171 17881 151211 -201611 237171 17881 151211	txlbs ftxlbs ftxlb	bsiftxibsif	tx1bs[f	txlbs[ftxlbs]	ftxlbslf	tx1bs1f1	tx1bs1ft	xlbs ftxlb	siftxibs	ftxlbs	ftxibsif	txlbs	ftxlbslf	txlbs
# -52.# 90.# 398.# -834.# 1321.# 413.# -413.# 359.# -208.# -179.# 104.# 0.# 0.# 7055    -25462  25071  -19  1266  -1250  13142 -13142  6267  -6365  -2089  2121 -18803  19096  55  # -35.# 110.# 797.# -613.# 1587.# 421.# -421.# 440.# -138.# -220.# 69.# 0.# 7.201    -25168  24538  -31  1250  -1224  12927  -12927  6134  -6292  -2044  2097 -18404  18876  54  # -17.# 130.# 1195.# -392.# 1853.# 430.# -430.# 522.# -68.# -261.# 34.# 0.# 0.# 0.# 7441    -24890  24102  -39  1236  -1203  12741 -12741  6025  -6222  -2008  2074 -18077  18667  53  # 1.# 150.# 1593.# -163.# 2110.# 435.# -435.# 601.# 3.# -300.# -2.# 0.# 0.# 7441    -20161  23717  179  1019  -1166  11411 -11411  5929  -5040  -1976  1680 -17788  15121  47  # 20.# 169.# 1991.# 83.# 2351.# 434.# -434.# 676.# 79.# -338.# -40.# 0.# 0.# 0.# 7425		01 12831		376.4	258.4	# ! -	- !	**		3	*!.		1	-319.#
# -35.# 110.# 797.# -613.# 1566   -1250   13142   -13142   6267   -6365   -2089   2121   -18803   19096   55   -2544   2071   -18803   19096   55   -25168   24538   -31   1250   -1224   12927   6134   -6292   -2044   2097   -18404   18876   54   -25168   24538   -31   1250   -1224   12927   6134   -6292   -2044   2097   -18404   18876   54   -24890   24102   -39   1236   -1203   12741   -12741   6025   -6222   -2008   2074   -18077   18667   53   -24890   24102   -39   1236   -1203   12741   -12741   6025   -6222   -2008   2074   -18077   18667   53   -20161   2377   179   1019   -1166   11411   11411   5929   -5040   -1976   1680   -17788   15121   47   -20161   2377   1788   15121   47   -20161   2377   1788   15121   47   -20161   2377   1788   15121   47   -20161   2377   1788   15121   47   -20161   2377   2348   4754   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764   4764	_	1		413.# -413.	359.	- #		0 **	.0	705	5.4-2156.*	**0	1338.4	-350.*
-35.#   110.#   797.# -613.#   1587.#   421.#   440.# -138.# -220.#   69.#   0.#   0.#   7201    -25168  24538  -31    1250  -1224    12927 -12927    6134  -6292  -2044    2097 -18404    18876    54    -25168  24538  -31    1250  -1224    12927 -12927    6134  -6292  -2044    2097 -18404    18876    54    -24890  24102  -39    1236  -1203    12741 -12741    6025  -6222  -2008    2074 -18077    18667    53    -24890  24102  -39    1236  -1203    12741 -12741    6025  -6222  -2008    2074 -18077    18667    53    -20161  23717    179    1019  -1166    11411 -11411    5929  -5040  -1976    1680 -17788    15121    47    -20161  23717    179    1019  -1166    1434.# -434.#   676.#   79.# -338.# -40.#   0.#   0.#   0.#   7425   -20165  23748    175    10041  -1166    1434.# -434.#   676.#   79.# -338.# -40.#   0.#   0.#   0.#   7425		}	2501	131421-131421	!	63651	1680	880	! _	5511		-23561		111291
-25168  24538  -31  1250  -1224  12927 -12927  6134  -6292  -2044  2097 -18404  18876  54	110.*	.* -613.*	1587.#	-421	**0++	#	.220.*	*	*	7201.	*-2200*	**0	1366.#	-357.*
# -17.# 130.# 1195.# -392.# 1853.# 430.# -430.# 522.# -68.# -261.# 34.# 0.# 0.# 7348  [-24890] 24102] -39] 1236] -1203[ 12741] -12741[ 6025] -6222[ -2008[ 2074]-18077] 18667[ 53  # 1.# 150.# 1593.# -163.# 2110.# 435.# -435.# 601.# 3.# -300.# -2.# 0.# 0.# 7441  [-20161] 23717[ 179] 1019[ -1166[ 11411]-11411[ 5929[ -5040[ -1976] 1680]-17788[ 15121] 47  # 20.# 169.# 1991.# 83.# 2351.# 434.# -434.# 676.# 79.# -338.# -40.# 0.# 0.# 7425			1522	12921-12921	-	,	1	971-1	1	1245	-4431	-23171	28601	109471
# 1.* 150.* 1593.* -163.* 2110.* 435.* -435.* 601.* 3.* -300.* -2.* 0.* 0.* 7441   -20161  23717  179  1019  -1166  11411 -11411  5929  -5040  -1976  1680 -17788  15121  47   -20.* 169.* 1991.* 83.* 2351.* 434.* -434.* 676.* 79.* -338.* -40.* 0.* 0.* 7425	' '	.* -392.4	853	-430.	\$22.#	#	•	•	*	7348.*	-2245.#	••0	1394.*	-364.#
150.# 1593.# -163.# 2110.# 435.# -435.* 601.# 3.# -300.# -2.# 0.# 0.# 7441 237171 1791 10191 -11661 114111-114111 59291 -50401 -19761 16801-177881 151211 47 169.# 1991.# 83.# 2351.# 434.# -434.# 676.# 79.# -338.# -40.# 0.# 0.# 7425	248901 241021 -3	191 12361	2031	127411-127411	0251	12229	<u> </u> _	20741-1807	186	5341	1164-	-22841	28191	107901
23717  179  1019  -1166  11411 -11411  5929  -5040  -1976  1680 -17788  15121  47 169.# 1991.# 83.# 2351.# 434.# -434.# 676.# 79.# -338.# -40.# 0.# 0.# 7425	*	-163.	2110.*	-435		*	300.			7441.*	-2274.#	**0	1411.4	-369.
169.# 1991.# 83.# 2351.# 434.# -434.# 676.# 79.# -338.# -40.# 0.# 7425	237171	10191	!	11411-11411	9291	50401	9761	16801-1778	121	4781	- 3911	-20461	25241	96641
)3348	20.# 169.# 1991		2351.#	-434	676.	*			•	7425	*-5269.*	**0	1408.*	-368.#
1131 10041 -1141 115411-115411 38371 -49691 -19451 16561-175111 149071	233481	10041	-11471	112411-112411	- 11683	1696	9451	16561-175111	11 149071	4711	-3851	-20151	24871	95191
9.0# 39.# 188.# 2390.# 328.# 2593.# 434.# -434.# 751.# 156.# -375.# -78.# 0.# 0.# 7412	39.4	į	593.	¥-43¢	151.*	*	375.	• •		7412.4-2265.4	2265.#	**	1406.*	-367.

\* | TORQUE| TORQ 72131 68401 4551 -3721 -19441 23991 16881 \* 0.# 1311.# 0.\* 1147.\* 23251 1019.\* 22451 21611 20721 764. 19791 18841 1787 573.4 1589 \$40.\* 14901 13911 × \*.0 -360 | -1884 -3481 -18191 \* \*\*0 \* \* \* \*.0 \*.0 . -215| -1127| # -3351 -17511 \* -14481 -2621 -13681 -12871 -12071 -16791 -16041 -15271 ₩ ₩ ₩ -\* -3071 -2921 -246] -2311 0.\* 6910.\*-2111.\* 0.# 6046.#-1847.# 0.\* 5374.#-1642.# 0.4 4397.4-1364.4 -321 4031.4-1232.4 0.4 3455.4-1056.4 -2771 -985.\* -924-# -869.\* -821.4 4837.4-1478.4 0.# 3721.#-1137.# **8 9 8** I 4251 3571 4411 2631 \* 4091 3931 3751 3381 3011 2821 3201 2687.\* \* \* 0.4 3225.4 3023.\* 2845.4 #STEER #MOTOR # RPM \*\* \*.0 \* \* \* 97671 -97671 51011 -42871 -17001 14291-153051 128611 13641-147321 122771 97081 969| -1107| 10845|-10845| 5631| -4794| -1877| 1598|-16893| 14383| 52861 -44701 -17621 14901-158581 134101 12951-14141 116631 85171 -85171 45121 -36751 -15041 12251-135361 110271 80771 -80771 +3071 -34571 -14351 11521-129211 103731 90361 8364 8551-104421 76971 54621 -46391 -18201 15461-163871 139191 #INNER # RPM # RPM \*. \*.0 \*•0 \* \*\*0 \*.0 \* \*.0 \*.0 \* \* \*.0 10781-122991 9291-110561 10041-116761 u -232. -281.\* -327.\* -416.4 -459-# -544. -585. -626. 404.# -404.# 806.# 251.# -403.# -126.# -181. -372.4 -502.\* #INNER 20 X ш 38921 -30121 -12971 -4092] -1636] 40991 -32361 -13661 62901 -62901 34801 -25651 -11601 # 362.4 -424.4 654.# -504.# 4713| -3887| -1571| 919.4 -598.4 -631. --665. -- 665-67341 -67341 36851 -27881 -12281 -157.# 1468.# 1252.# -734.# 4.64.4 -448.4 745.4 -534.4 -566. -475.4 RUN DATE:No. 15-AUG-85:113 \$\pi\n\mathrm{F}\mathrm{R}\mathrm{E}\mathrm{R}\mathrm{E}\mathrm{C}\mathrm{F}\mathrm{R}\mathrm{E}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\mathrm{F}\m RPM \* RPM 833.4 189.4 -189.4 1263.4 1004.4 1087. -166.# 1398.# 1170.# 561. 847.4 202.# -202.# 1196.# # \*\*968 1008.# 49101 1131.\* -177. 1330. \* 1068.\* \$.056 4 RPR 4 RPR 4 RPM 9381 -10741 105091-105091 9041 -10391 101491-101491 314.4 -314.4 93661 -93661 89481 -89481 7631 -7631 71821 -71821 354.4 -354.4 -- 257.# -236.\* -218.4 -283.4 177.\* 283.\* 257. 236.\* 218.\* 166.\* 157.\* \*OUTER 8671 -10021 -6771 648.# 2759.# 224.# 3585.# 1370.# 3012.# -3641 -884 299.4 5576.4 2880.4 3935.4 -843[ -7601 -7181 2871.\* 237.# 3983.# 1695.# 3173.# 252.# 4381.# 2006.# 3349.# -924 3733. 4144.# -8011 **4356.** 350.4 6771.4 3703.4 4572.4 4192.# 267.4 4779.4 2305.4 3537.4 AT MAXIMUM TURN CONDITION #DUTER # PROP #DUTER #INNER #SPROK #MOTOR # B # B A RPK & RPK & RPK & RPK 6151 5701 1461 3186.\* 1023.\* 8291 7881 703 316.4 5974.4 3158.4 659 5261 283.4 5178.4 2596.4 3433.4 367.4 7169.4 3971.4 202.# 2788.# 1683 181 1651 1641 164 165 1661 168 171 174 333.# 6373.# 1771 184 1-10262| 13923| 1-191771 225251 217. 1-18559{ 21850} 1-178811 211441 1-17148| 20407| 1-163691 196471 [-15551] 18855] 1-147031 180481 1-13831| 17228| |-12944| 16399| 1-12049| 15568| 1-111531 147411 13.54 116.4 18.0\* 186.\* 21.04 230.4 22.54 251.0 63.\* 16.5# 164.# 292.\* 27.04 313.4 \*\*06 140.# 208.\* GEAR LOADS I MAX #INNER # VEH #SPROK # 15.0\* 12.0# 24.0# 10.5# HOE

GEAR MAXA VEX #	GEAR LDADS I MAX #INNER : VEH #SPRDK :	GEAR LDADS AT MAXIMUM TURN COND) Max #Inner #duter # prop #duter Vem #Sprok #Sprok #motor # 8	HUM TUR # PROP #MOTOR	N CONDITI *OUTER *1	01 *	NER 401	CC	RUN F	~ ਨ	TE:No. 19 #0UTER #1	5-AUG- Inner D	85:113 #OUTER # E	# IN NE	~	#0UTER #1	INNER 0	#STEER #HOTOR	T	##	**	¥ *		* *
*	,	* *	*	# #	#	# H d 3	# &	# RPM	•	*	a a	# #	X 0.	*	A M	#	E O M	# RP M	#	*	RPM	# #	#
	TORQUE	TORQUE! TORQUE! TORQUE! TORQUE!	TORQUE   TORQUE   TORQ ftxlbs   ftxlbs   ftxl	TORGU		DRQUE 17 tx1bs1f	orqueitorqueitorqueitorqu txibsiftxibsiftxibsiftxib	11080	TORQUEITO	TROUGH	TORQUE	El TORQUE   TORQUE   TORQUE   TORQU siftxibsiftxibsiftxibsiftxib	Elforque siftx15s	00E   TO	1 = 5	RQUE Klbs	TORQUE		TORQUE   TO	ORQUE LTORQUE I	ORGUE tx1bs	15 ±	QUE 1
28.54	333.*		384.* 7568.# 4236.#	4 4236	- 1	5014.#	149.	4 -14	**6	1538.4	1333.	* -769.	9-	4.19	*,0	**0	2546	.* -77	**	•	483.*	7	26.\$
-		-93841 131191	1881	1 4831	}	-6371	12885	?	8521	32791	-23461	1 -10931		921	-98391	70381	245		2001 -	-10491	1294	-	1956
30.0	353.#	- 1	402.4 7966.4 4498.4	8655 #		237.4	142.	# -1	42.# 1	<b>***</b>	1414.	+-804	.* -707	7.*	**0		2418	- 4°	39.*	**0	4.89.4	1	\$.02
_	-8524	-8524 12334	1921		- 1011	-598	14245	1	-54241	30831	-2131	1 -1027		1101	-92501	16669	227	-1	861	-9721	1200	5.5	- 76
31.5#	373.	-	420.# 8364.# 4759.#	* 4759	In	463.	135.	.# -13	* .	1679.	1494.	* -839.	191- 4-	***	0.*	0.*	2303	* -704	***	•••	437.4	# -1	-114.*
_		-76861 115721	1961	1666 1	l I	-5591	2008	11 -50081	}	18687	-1921	196- 1		1059	-86791	5765	210	<u> </u>	1711	-8981	1108	3	42411
33.0#	393.*		438.* 8762.* 5019.*	* 5019	2	4.169	129.	129	*	1750.#	1574.	* -875.	.* -787	***	**0	**0	. 2199.	19- 4	*-21	*.0	417.4	-10	**6
-	-6876	-68761 108381	1661	1656 1		1225-	4607	l —	11094-	27091	-1719	1 -9031		5731 -	81281	5157	193		581	-825	10191		39011
34.5	413.		455.# 9161.# 5277.#	1125 #		919.*	123.	# -123.	-	822.#	1653.	* -911	.* -826	#-9	*:	*.0	2103	9- **	43.#		399.	1 -104	**
_	9609-	-60961 101331	1 203	1 3201		-4871	4221	1 -42211	:	25331	-1524	-	441 5	081	-76001	45721	111	_	-1441	-7561	933	35	5741
36.0#	433.4		473.4 9559.4 5534.4	<b>\$ 5534</b>	•	149.#	118.	.* -118	*	894.4	1732.	* -947	** -866	**9	0.4	0.	2015.	19- #	**91	**	382.		+.001-
_	-5351	1 94621	1 2071	1 284	}	-4531	3852	<u>'</u>	38521	23651	-1337	1 - 78	8	451	-70961	4013	161	-	321	1069-	8521	į	32621
37.54	453.4	* 492.*		9957.# 5789.#	•	381.*	113.	113.	*	**996	1811.*	-983	6- *	05.*	0.*	*.	1935.	+ -5	91.*	**	367.		<b>**96-</b>
-	-46411	1 8826	1 2111	ľ	- 16	-4211	3502	-3	1205	19022	-1160	1 -73	51 3	198	-56191	34811	146	<u> </u>	-1201	-6271	1141	İ	19962
39.0#	472.*	1	510.*10356.* 6044.*	* 6044.*	•	613.	109.	.* -10	09.# 2	2039.*	1889.	-1019	¥6- #*	***	**0	•••	1860.	* -568	# 8	0.*	353.4	'	92.4
-	-39701	8227	1512 1	1 215	}	-3911	31728	1	31721	20561	1266-	89-		3301 -	-61701	29781	133		180	-5681	701	92	1989
<b>*0°2</b>	492.#	- 1	528.#10754.# 6298.#	<b>*</b> 6298.	•	845.#	105.	-10	05.# 2	2112.*	1968.4-1	056	6- #.	84.*	0.*	0.*	1791.	4 -547	7.*	**0	340.4	1	# ° 6 8.
-	-33391	1 76651	2161	1 1841	-	-3631	2862	1 -28621		19161	-8341	-63	- 8	- 1812	57481	25041	120	-	186	-5131	633	*	16292
45-0#	\$11.	- 1	546.#11152.#	* 6551.*	_	1.610	101.	+ -101	1.* 21	185.#	2046.#-1	092	.4-1023.	3.4	**0	0.*	1727	.* -52	28.#	••	328.	'	**98
_	•	1141	1122	1 1551	l	-3361	2572	1 -2572	_	17851	-6871	-595	_	- 1622	19563	20611	101	-	981	-4611	5691	71	21781
43.54	531.#	;	564.411550.4	* 6804.*	-	313.4	98.	6- *	8.# 2	258.#	2124.4-	t-1129.	. 4-1062	.5.*	*.0	0.*	1668.	<b>*</b> -51	*	••	316.		-83.#
-	-21961	1 66561	1 224 1	1 1281	81	-3124	2302	1 -2302	_	19991	-549	1 -554		1831 -	12667	1647	96	_	161	-4121	1605	61	1676
45.0#	550.# 583	583	583.#11949.# 7056.#	* 7056	~ 1	548.*	96	6- #•	94.# 23	331.4	2201.1	.*-1165.	#-11	.01.*	* 0	**0	1612.	i H	93.#	**0	306.		+*08-
		_	1877	1031		-2891	2053	1 -20531	1	15521	-421	1718- 1		1401 -	-46561	12641	8	_	-101-	-3681	1454	17	381
**	**************************************	设备的基础存储的 化苯基甲基苯基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲	****	***	#	****	***	*	***	****	****	****	***	***	****		***	***	***	****	***	*	# #

statesestatesestatesestatesestatesestatestatestatestatestatestatestatestatestatestatestatestatestatestatestates Max einner eduter inner bouter binner bouter bluner bouter binner bouter || IORQUE|| TORQUE|| || Fixibs|| Fixibs 269. | -331. | -2534. | 3119. | 5777. | -7112. | 4459. | -5490. | -6993. | 8609. | 31889. | -39258 | 12308. | -15152 |-18891|23357| 1115.| -902.| 263.| -325.|-2480.| 3066.| 5654.|-6991.| 4365.|-5397.|-6845.| 8463.|31212.|-38589|12047.|-14894| |-25773|25773| 1230.|-1230.| 359.| -359.|-3383.| 7714.|-7714.| 5955.|-5955.|-9338.| 9398.|42582.|-42582|16435.|-16435 354.| -354.|-3338.| 3338.| 7612.|-7612.| 5876.|-5876.|-9214.| 9214.|42016.|-42015|16217.|-16216| 275.| -337.|-2594.| 3179.| 5915.|-7247.| 4566.|-5594.|-7160.| 8773.|32651.|-40005112602.|-15440| 1152. - 939. | 274. | -336. | -2583. | 3167. | 5889. | -7222. | 4546. | -5575. | -7129. | 8742. | 32507. | -39864 | 12546. | -15386 | 273.| -335.|-2573.| 3158.| 5867.|-7201.| 4529.|-5559.|-7102.| 8717.|32387.|-39750|12500.|-15342| \*.0 \*.0 \* \* 0.# -186.# 186.# 244.# -245.# -37.4 -237.4 -347.# -455.# 0.4 115.4 406.4 -152.4 -534.¢ 165.4 -302.4 TOW # +-49-+-16-GRADE, \$ \* 0.0 COEFFICIENT OF RICTION \* 0.70 MAXIMUM ACCELERATION, 9\$ \*0.50 COEFICIENT OF DRAG = 1.00 WARE A KOR & KOR & KOR & KOR & KOR & KOR & KOR 229.# 28.# 180.# 264.\* 346. 0.4 -125.4 \*\*64 71. 0.\* 169.\* \*.0 \*.0 \*.0 REVISION: 16-JUL-85 RUN DATE: 15-AUG-85:111 \*.0 \* \*\* \* THIN DRIVE MOTOR SET-UP \*.0 \*.0 \*\* ROLLING RESISTANCE, 1b per ton= 100.0 CONFIGURATION I -67.\* 67.\* -1410.\* 1411.\* 1611# -1612# -513.# 513.# 675.# -675.# 454.4 -833.4 -246# -1562# 78.# 497.# -103.# -654.# -422¢ -2289¢ 135.¢ 729.¢ -177.¢ -959.¢ 955.4 -258.4-1256.4 876.# 3080.# -1001# -3520# 319.# 1120.# -419.#-1474.# -1466# -3958# 467.# 1260.# -614.#-1657.# TREAD MIDIM, in. = 109.8 TRACK LENGTH, in. = 183.1 TRACK PITCH, in. = 7.63 NUMBER OF SPROCKET TEETH = 11 BY: RICK LEWIS: 633.4 -6174 -29994 196.4 10844 -19884 -345.4 Efficiency data for Momopolar motor by Gene Siedler 20-MAY-85 MON A MON A MON A MON A MON A MON 40.0 GEAR LOADS AT MAXIMUM TURN CONDITION 1156.1 -943.1 1149.1 -936.1 1134.1 -921.1 1284.4 3464.4 -949.# 1740.# 1214. [-1214.] 216.# 1367.# 540.# 2625.# GROSS VENICLE MEIGHT, tons = MAXIMUM VELOCT Y, mph = 45.0 ENGINE GROSS N2 = 1000.0 LOSS ENGINE HP. = 120.0 370.# 2004.# FRONTAL AREA, ft^2 = 68.3 INPUT DATA: 1-193011237611 26.4 125.4 7.54 42.4 147.4 -45.# 83.# 1-254301254301 3.0\* 10.\* 65.\* 1-19675|24128| 1-19762 | 24213 | 1-196021240591 18. \*0.0 1.5# \*0.9

医骨髓 化 医甲基二甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基	MAN A ROM A ROM A ROM A ROM
TORQUE  TORQ	TORQUE   TOR
.# -1956# -4373# 623.# 1391.# -819.#-1831.# 0.# 0.#	226.* 504.* -297.* -663.* 0.* 0
-880.  257.  -319. -2419.  3006.  5516. -6854.  4258. -5291. -66	677-1 8297-130446-1-37832111751-1-14603
4193.# -2442# -4791# 777.# 1525.#-1023.#-2006.# 0.# 0.# 2	282.4 552.4 -371.4 -727.4 0.4 0
-857.   250.   -312.   -2357.   2945.   5374.   -6714.   4149.   -5183.   -65	506.1 8128.129666.1-37063111450.1-1430
4555.# -2932# -5205# 933.# 1656.#-1228.#-2179.# 0.# 0.# 3	338.4 600.4 -445.4 -790.4 0.4 0
-833.  243.  -305. -2291.  2880.  5224. -6566.  4032. -5069. -63	6323.   7948.   28835.   -36245   11129.   -1398
.* -3433# -5608# 1093.# 1785.#-1438.#-2348.# 0.# 0.#	396.* 647.* -521.* -851.* 0.* 0
1021.1 -806.1 235.1 -298.1-2217.1 2807.1 5055.1-6400.1 3902.1-4941.1-6120	20.1 7748.127905.1-35329110771.1-1363
.* -3933# -6013# 1252.# 1913.#-1647.#-2517.# 0.# 0.# 4	53.* 693.* -597.* -912.* 0.* 0.
-778.1 227.1 -290.1-2139.1 2731.1 4878.1-6226.1 3765.1-4806.1-59	905-1 7536-126926-1-34365110393-1-13263
.* -4456# -6334# 1418.# 2035.#-1866.#-2677.# 0.# 0.# 5	14.* 737.* -676.* -970.* 0.* 0.
958.1 -742.1 217.1 -279.1-2042.1 2634.1 4655.1-6005.1 3593.1-4636.1-56	635.  7270. 25695. -33150  9917. -12794
5926.t -4983t -6772t 1586.t 2155.t-2086.t-2835.t 0.t 0.t 5	575.# 781.# -756.#-1027.# 0.# 0.
-702.1 205.1 -268.1-1930.1 2524.1 4401.1-5755.1 3397.1-4442.1-53	327.1 6966.124292.1-317661 9376.1-12260
.* -5499# -7160# 1750.# 2278.#-2302.#-2998.# 0.# 0.# 6	34.4 825.4 -834.4-1086.4 0.4 0
877.1 -660.1 193.1 -256.1-1816.1 2411.1 4140.1-5497.1 3196.1-4244.1-501	5011.1 6655.   22852.   -30345  8820.   -11712
5256.# 6612.# -6006# -7557# 1911.# 2405.#-2515.#-3164.# 0.# 0.# 69	92.4 871.4 -911.4-1146.4 0.4 0.
-618.   180.   -244.  -1699.   2296.   3874.  -5236.   2991.  -4041.  -465	90.1 6338. 21386. -28900  8254. -1115
5694.# 6966.# -6507# -7960# 2071.# 2533.#-2724.#-3333.# 0.# 0.# 7	750.# 918.# -987.#-1208.# 0.# 0.
-575.1 168.1 -231.1-1582.1 2181.1 3606.1-4972.1 2784.1-3838.1-436	366.1 6018.119907.1-274431 7683.1-10592
6127.* 7324.* -70024 -8370# 2228.# 2663.#-2932.#-3504.# 0.# 0.# 80	07.* 965.*-1062.*-1270.* 0.* 0
-532.   155.   -219.   -1464.   2065.   3338.   -4708.   2577.   -3634.   -4041	41.   5699.   18427.   -25987   7112.   -10030
6556.# 7686.# -7492# -8784# 2384.# 2795.#-3137.#-3678.# 0.# 0.# 8(	64.¢ 1013.¢-1137.¢-1332.¢ 0.¢ 0
709.1 -490.1 143.1 -207.1-1347.1 1950.1 3072.1-4446.1 2371.1-3432.1-371	18.1 5382.116956.1-245411 6544.1 -9472
! 2	.1 143.1 -207.1-1347.1 1950.1 3072.1-446.1 2371.1-3432.1-

\* -84.1 -159.1 795.1 363.1-1812.1 280.1-1399.1 -439.1 2194.1 2004.1-100041 773.1 -38611 46.| -113.| -438.| 1064.| 999.|-2427.| 772.|-1873.|-1210.| 2938.| 5517.|-13395| 2129.| -5170| 626.1-1733.1 -981.1 2718.1 4474.1-123911 1727.1 -47821 | IORQUE|IORQU|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|IORQUE|I 589. | -367. | 107. | -172. |-1009. | 1619. | 2301. |-3690. | 1776. |-2849. |-2785. | 4467. |12700. |-20369 | 4902. | -7862 | 65.| -130.| -609.| 1229.| 1389.|-2803.| 1072.|-2164.|-1682.| 3393.| 7669.|-15471| 2960.| -5971| 96. | -161. | -903. | 1515. | 2058. | -3453. | 1589. | -266. | -2491. | 4180. |11361. | -19061| 4385. | -7357| -6410 \*OUTER \*INNER \*OUTER \* F \* G \* G # RPH \* \* 119. | -183. | -1119. | 1726. | 2551. | -3936. | 1970. | -3038. | -3089. | 4764. | 14084. | -21724 | 5436. | \* 75. | -140. | -702. | 1320. | 1602. | -3009. | 1236. | -2323. | -1939. | 3642. | 8841. | -16608 | 3412. | \*\* •• 449.1-1562.1 -704.1 2450.1 3212.1-111711 1240.1 \* 85. | -150. | -800. | 1415. | 1825. | -3226. | 1409. | -2490. | -2209. | 3905. | 10073. | -17806 | 3888. \*\* # # 917.1-2014.1-1439.1 3158.1 6560.1-144001 0.# 1412.# 1507.#-1858.#-1983.# 0.# 1522.# 1605.#-2003.#-2112.# 0.4 1195.4 1307.4-1573.4-1719.4 0.¢ 1249.¢ 1357.¢-1644.¢-1785.¢ 0.# 1304.# 1407.#-1715.#-1851.# 0.# 1358.# 1457.#-1786.#-1917.# 0.# 1467.# 1556.#-1930.#-2048.# 920.# 1061.#-1210.#-1396.# 975.# 1109.#-1283.#-1460.# 0.# 1031.# 1158.#-1356.#-1524.# 0.4 1086.4 1208.4-1429.4-1589.4 0.# 1141.# 1257.#-1501.#-1654.# # RPM #INNER # RPM GEAR LDADS AT MAXIMUM TURN CONDITION

MAX #INNER #OUTER #INNER #OUTER #INNER #OUTER #INNER #OUTER #INNER #OUTER

VEH #SPROK #SPROK# MOTOR #MOTOR # A # B # B # C # C # D # D # E # E \*\*0 \*.0 \* \*\*0 \* \* \*\* \* \*.0 \*.0 \*\*0 \* \*.0 \*.0 38.1 -104.1 -356.1 985.1 811.1-2245.1 55.1 -121.1 -521.1 1144.1 1188.1-2609.1 888.1 582.1-2024.1 11552.#12185.#-13201#-13926# 4201.# 4431.#-5527.#-5830.# 9483.010297.0-108384-117684 3449.0 3744.0-4538.0-4927.0 9895.#10677.#-11308#-12202# 3598.# 3883.#-4734.#-5109.# 10305.#11058.#-11776#-12638# 3747.# 4021.#-4931.#-5291.# 512.\* 546.\* 10716.\*11439.\*-12246\*-13072\* 3897.\* 4160.\*-5127.\*-5473.\* 4295.4-5327.4-5652.4 9071.4 9919.4-103664-113354 3299.4 3607.4-4340.4-4746.4 6981. # 8052. # -7978 # -9202 # 2539. # 2928. #-3340. #-3853. # 7404.# 8421.# -8461# -9623# 2692.# 3062.#-3542.#-4029.# 7823.4 8792.4 -89414-100484 2845.4 3197.4-3743.4-4207.4 -94184-10475# 2997.# 3333.#-3943.#-4386.# -9893#-10904# 3148.# 3470.#-4142.#-4565.# -94.1 -255.1 11134.#11812.#-12724#-13499# 4049.# 27.1 17.1 447.1 -222.1 358.1 -129.1 387.1 -159.1 628.1 -407.1 -93.1 8241.# 9166.# 551.1 -328.1 8657.# 9541.# 480.1 -255.1 416.4 -190.4 289.1 -58.1 514.1 -291.1 HOW # 323.1 \$64. 585. -12121 60551 453.4 492.4 472.# 510.# -33391 81071 -1944| 6761| 373.4 420.4 433.4 473.4 -46411 93641 492.# 528.# -27081 75001 333.\* 384.\* 353.# 402.# 393.4 438.4 413.# 455.# -5351 | 10052 | 1 -39701 87151 -6876111537} 1 -9384 [13992] 1 -8524[13148[ 1 -76861123291 -60961107771 531.4 \* RPM 34.54 37.5 39.0\* 30.08 33.0\* IPI

B.2.E Maximum Power Gear Loads And Speeds

These tables are identical to those of Appendix Section B.2.D except that they are for the full range of specified speed vs tractive effort. Refer to Section B.2.D if a detailed explanation of the data sheets is needed.

INPUT DATA:

ENGINE NET HP. = 440.0 MAXIMUM VELOCITY, mph. = 45.0 NUMBER OF SPROCKET TEETH = 11 GRDSS VEHICLE WEIGHT, tons = 19.5 TRACK PITCH, in. = 6.03

CONFIGURATION I THIN DRIVE MOTOR SET-UP Efficiency data for Westinghouse induction motor # by Craig Joseph 10-MAY-85 #

r	# RPM	1 TORQUE	24.	.1 2357.	**	.1 1791.	.* 72.	.1 1282.	•96 *•	.1001.	•	.1 818.	** 143.	.1 697.
INNER	<b>X Y</b>	TORQUE ftlbs	24.*	2355.	<b>4</b> 8	1789.	72.\$	1281.	<b>**96</b>	10001	119.*	818	143.*	-969
	#		110.#	-	221.#	847.1	331.#	1-905	441.4	473.1	552.	387.1	662.#	330.1
OUTER	RPM	TORQUE ftxlbs	11(	1115.	22	8	33:	906	44	14	25.	38	99	33(
##	#		#	-	#	-	#	-	#	-	#	-	#	-
INNER	RPM	TORQUE ftxlbs	110.	1115.	221.	847.1	331.	606.1	441.4	473.	552.#	387.	<b>662.</b>	330.
**	#		#	-	#	-	#	-	#	-	# ·	-	<b>#</b>	-
OUTER C & D	RPM	TORQUE ftx1bs	-45.	-11678.	***	-3871.	-126.	-6351.	-168.	-4929*	-211.*	-4055-1	-253.	-3452.
##	#		*	-	*	-	#	-	*	-	#	-	#	-
INNER C & D	RPM	TORQUE ftx1bs	-45.	-11678.	+.48-	-8871.	-126.	-6351.	-168.	-4959-1	-211.*	-4055.	-253.	-3452.
##	Ħ		#	-	#	-	#	-	#	-	*	-	*	-
OUTER B	RPM	TORQUE	-153.	-3475.	-306-	-2640-	<b>**09*</b> -	-1890.1	-613.	-1476.	-166.	-1206.	-919.	-1027-1
##	#		#	-	#	-	*	-	#	-:	*	-	#	-
INNER	RPM	TORQUE ftx1bs	-153.#	-3475.	-306-	-2640-	<b>**09</b> *-	-1890.	-613.	-1476.	-166.	-1206-	-919.	-1027.
##	#		\$*00€	-	<b>**666</b>	-:	*	=	*		*	-	*	=
OUTER MOTOR=A	RPM	TORQUE ftx1bs	20(	1043.	66	792.	1499.	567.	1999.	443.1	2499.	362.	2998.	308
##	#		500•≉	- :	<b>**666</b>	792.1	*	-:	#	3	*	-:	*	
INNER MOTOR=A	S.	TORQUE	506	1043.	66	19.	1499.	567.1	1999.	443.	2499.	362.	2998.	308
* *	#		24.#	-	<b>4.8.</b> #	-	72.4	-	<b>\$.96</b>	-	#	-	#	-
OUTER SPROK	RPA	TORQUE	24	20596.1	8 4	15646.	7.2	11201.	96	8746.	119.	7151.1	143.4	6088
**	#	 	24.#	-	# 8 *	-	72.#	-	#*96	-	#	-	*	7
MAX # INNER # OUTER # INNER # OUTER # I VEH # SPROK # SPROK # MOTOR=A # MOTOR=A #	R G	TORQUE ftx1bs	54	20596.	8	15646-	72	11201.	96	8746-1	119.	7151.	143.	6088.1
MAX #	MPH #	. •	B-73	!	3.0#	-	4.5	-	<b>*0*9</b>	-	7.5#	<del>"</del>	<b>*0°6</b>	-

OUTER F	S P M	TORQUE	167.	608	191.	535.	215.	478	239.	433.	263.	396.	287.	365.	310.	336.	334.	312.	358.	292.	382.	273.	+06-	257.	430.	243.
INNER #	RPM::	TORQUE   ftlbs	167.#	608-1	191.#	535.1	215.#	478.1	239.#	432.1	263.#	395.1	287.*	364.1	310.4	336.1	334.#	312.	358•#	291.1	382.	273.1	<b>4.90</b>	257.1	430°*	243.1
N H #	<b>∝</b> #	5+	#	_	#	_	#	_	#	_	#	_	41	-	45		#	_	#	_	#	_	#	_	#	_
OUTER E	R P R	TORQUE	772.	288.	882.	253.	993.	226.	1103.	205.	1213.	187.	1324.	172.	1434.4	159.	1544.#	148.	1655.	138.	1765.	129.	1875.	122.	1986.	115.
* *	#		*	-	#	-	#	-	# •	-	#	-	#	-	#	-	#	-	#	-	#	-	#	-	*	-
INNER	A F	TORQUE	772	288	882	253	993	226	1103	205	1213	187	1324	172	1434	159	1544	148	1655	138	1765	129	1875.	122	1986	115.
##	¥		*	3.	4.	1.1	*.	1.6	#•#	4.1	3.4	0	5. 4	9	# 8	1.1	*	8.1	2.#		*		**9	-:	*	3.1
DUTER C & D	E G	TORQUE ftx1bs	-295	-3013	-337	-2651	-379,	-2369.	-421	-2144	-463	-1960	-505	-1806	-548	-1667	-590	-1548	-632	-1444	-674	-1354	-716.	-1274	-758	-1203
% # #	#		5.	3.1	37.#	1:-	<b>*</b> •6	1.6	1. *		₩•	0	¥.	6.1	*	7.1	**	8.1	2.4		#	-:	***	-	*	3.1
20-AUG-85 Inner C & D	S S	TORQUE ftx1bs	-295	-3013	-33	-2651	-379	-2369	-421	-2144	-463	-1960	-505	-1806.	-548	-1667	-590	-1548	-632	-1444.	-674-	-1354	-716	-1274.	-758	-1203
. * *	#		₩ •	6.1	# 9	89.1	<b>*</b>	5.1	<b>2.</b> #	38.1	# •9	3.1	<b>*</b> •6	37.1	<b>2.</b> #	6.1	₩. ₩	1-1	<b>4.</b> 6	30.1	2.*	3.1	# 2	1-6	*	
DATE:No DUTER B	R P M	TORQUE	-107	68-	-122		-1379	-705.	-1532	-63	-1686	-583	-1839	-53	-1992	-496	-214	-461	-2299	-43	-2452	-403-	-2605	-379.	-2758	-358
× * #	#		#	5	# 9	9.1	<b>#</b>		*		<b>*•9</b>	-	<b>*</b> *	-	*	-	#	-	#	-	#	-	#	-	*	-
INNER B	α A A	TORQUE ftx1bs	-1073.	968-	-122	-78	-137	-705	-1532	-638	-168	-583,	-1839	-537	-1992	-496-	-2145.	-461	-2299	-430	-2452	-403	-2605.	-379	-2758	1 35 8 2 1 1 2 1 2 1 2 1 2 1 1 1 1 1 1 1 1 1
**	#		#	269.1	*	1:-	#	212.1	* -	=	*•	175.1	*	161.	#	-	#	-	#	-	#	-	#	-	*	<u>-</u>
CONDITION : DUTER : HOTOR=A	SE SE	TORQUE	3498.#	792	3998	237	4498.	21	4997.	191:	5497.	17.	5997.	16	<b>**1649</b>	149.	<b>**9669</b>	138.1	7496.	129.1	1996.	121	8496*	114.1	8995	107.
<b>##</b>	#		# *	269.1	*		*	2.1	*• 2	2.1	#•	175.1	#	-	#		*		#	-	#	-	#	-	#	7
VE EFFORT Inner Motor=a	S. F.	TORQUE	3498.4	56	3998	237	4498	212	1664	192	5497	17.	5997	161.	\$.197.	149-1	<b>\$*9669</b>	138.	7496.	129.1	\$-9661	121.1	8496.	114.1	\$995.	107.1
TRACTIVE R * I	#		167.*	-	*	-:	215.	-	#	-	#	-	#	-	#	-	#	-	#	<b>-</b>	#	-	#	-	#	-
MAXINUM TRA	R E	TORQUE	16	5314.1	191	4675-1	21;	4179.1	239.	3781.1	263.	3456.	287	3186.	310.	2940-1	334	2730.	358	2547.1	382	2387.	<b>**90</b> *	2247.1	430	2121.
MA # #	#		167.*	-:	*	- :	215.*		239.#	-	#	-	*	-	*	=	#	-	\$ <b>1</b>	-	#	-	#	-	*	<b>-</b>
LDADS AT INNER SPROK	R P	TORQUE	167	5314.	191	4675.1	215	4179.1	239	3781	263	3456.	287	3186.1	310	2940-1	334.*	2730-1	358•#	2547.1	382	2387.	<b>**90</b>	2247.1	430	
	#		10.5*	-	12.0#	-	13.5≉	-	5.0≄	-	16.5	<u>-</u>	*	D 7,	,	_	*	-	*5#	_	<b>*</b>	-	÷5.		*	
GEAR MAX VEH	X T Q	İ	10	į	12.		13.	İ	15.	İ	16.	ľ		B <b>-7</b> 4	t		21.0		22-	 	24.0		25.5		27.0	

		ш (л		•	<b>.</b>					<b>.</b>	• 1	•	e 1	2.		4.		7.	645.	1.	6 I	5.	93.	<b>.</b> 64	9 !	•
OUTER	RPH	TORQUE ft1bs	454	230,	478	218.	501.	208	525.	198	549.	190	573.	182	597	174.	621	167.	99	161	699	155	69	14	716	144.
##	#		454-#	-	*		501.#	*	*	-	±*695		573.#	182.1	7.4	174.1	*	167.1	\$.	160.1	<b>*•699</b>	4.1	693.	149.1	716.	144.1
I NN ER F	E P	TORQUE ftlbs	45	230	478	218	50	208	525	198	3	190-	57	88	597	17	621	16	645	16	99	154	69	14		14
##	*		*	9.1	#	3.1	*	1.86	4.	94.1	7.*	90.1	<b>*•</b>	9.1	#	2.1	*	9.1	# 1	1.91	# 6	3.1	\$ -66	0.1	309.*	68.1
OUTER E	RPM	TORQUE ftx1bs	2096	109	2206.	103	2316	6	2427	6	2537	6	2647	<b>&amp;</b>	2758	80	2868	7	2978	-	3089	7	319	1	330	
# #	#		*	-	#	-	#	-	#	-	#	0.1	#	1-9	#	2-1	#	9-1	# 8	<b>6.</b> 4	#	3.1	*	70.1	309.#	68.1
INNER	RPM	TORQUE ftxlbs	2096.*	109	2206.*	103	2316	86	2427	<b>76</b>	2537	6	2647	8	2758	80	2868	-	297	•	3089	1	3199	1	330	9
##	#		#	-	#	-	#	-	#	-	#	-	#	-	*	-	#		*		#•6	1.5	*	- B	*	2.1
OUTER C & D	S F	TORQUE ftx1bs	+800-	-1139.	-842	-1082	-884	-1030	-927	-983	696-	-940	-1011	-901	-1053	-863	-1095	-828	-1137	-196	-117	-766	-1221	-738	-1264	-712
co # #	#		# -4	7	#	-	<b>#</b>	-	#	-	#	-	<b>#</b>	-	#	-	#	-	#	-	#	-	#	-	#	=
20-AUG-85; Inner C & D	RPH	TORQUE	#4008-	-1139.	-842	-1082	-884	-1030	-927	-983	696-	046-	-1011	-901	-1053	-863	-1095	-828	-1137	-961-	-1179	-766	-1221.	-T38	-1264	-712.1
* * 50	#		#	-	#	-	#	-	#	-	#	-	#	-	#	-	*	-	#	7	#	-	#	-	*	-
DATE:No Duter B	RPM	TORQUE	-2912.	-339.	-3065	-322	-3218	-307	-3371	-293	-3525,	-280-	-3678.	-268	-3831	-257.	-3984	-246	-4138	-237	-4291	-228.	-4444.	-219.	7654-	-212.
2 2	#		#	-	#	-	Ħ	-	#	-	#	-	#	-	*	-	#	-	#	-	#	-	*	-	*	-
INNER B	RPM	TORQUE ftx1bs	-2912.	-339,	-3065	2	-3218	-307	-3371,	-293	-3525.	-280-	-3678.	-268.	-3831	-257	-3984*	-246.	-4138	-237.	-4291	-228	++++-	-219.	1654-	-212-
* *	#		#	-	#	97.1	#	92.1	#	88.1	#	84-1	#	80.1	#	11.11	#	74-1	*	71.1	**	68-1	*	1.99	*	1.49
CONDITION : OUTER : MOTOR=A	RPM	TORQUE ftx1bs	9495.	102.	<b>**</b> 9666	6	10495.#	6	10994.#	8	11494.	8	11994.#	80	12494	1	12993	7.	13493.	7	13993.	9	14493.#	9	14992.	•
**	#		#	-	#	97.1	#	-	*	88.1	#	84-1	#	80.1	#	1.17	*	74.1	# *	71.1	#		*	1.99	*	64.1
VE EFFORT INNER MOTOR=A	A P	TORQUE ftx16s	9495	102	:*5666	16	10495	92	10994.	8	11494.	8	11994	8(	12494	77	12993	7,	13493.#	7	13993.#	89	14493.	9	14992.	Ý
TRACTIVE R # II K # HO	#		#	-	#	-	#	-	15	-	#	-	#	-	#	-	#	-	#	-	#	-	693.≉	-	**	-
MAXIMUM TRA # DUTER # SPROK	RPM	TORQUE	454°#.	2009-1	478	1908	501.	1817.1	525	1734-1	549	1659	573	1589	597.	1522	621.	1461.1	645.#	1403-1	<b>**699</b>	1350-1	693	1301-1	1.6.	1255.1
MAXI **	#		#	-	#	-	#	-	#	-	<b>**6</b>	-	*	-	#	-	*	-	#	-	#	-	#	-	#	-
LOADS AT INNER SPROK	RPM	TORQUE ftx1bs	454.#	2009.1	418.	19081	501	1817.1	525.#	1734-1	549	1659.	573.	1589.	597.#	1522	621.*	1461.1	645.	1403-1	699	1350	693	1301.1	716.#	1255-1
GEAR LO Max & Veh &	# Hdw		28.5*	-	30.0#	-	31.54	-	33.0#	-	34.5≉	_	В	<b>-</b> 75	٠.	-	39.0⊄	-	40.54	-	42.0#	-	43.5≉	-	<b>4</b> 5 • 0 <b>*</b>	-

GEAR LOADS MAX #INNER VEH #SPROK	LOADS DU #INNER #0 #SPROK #5	BURING MA #OUTER # #SPROK #M	MAXIMUM TRACTI # PROP #OUTER #MOTOR # B	> * *	E EFFORT INNER #0 B #	COND	œ	#0UTER #1	RUN DATE: NNER #DU	# # #	-AUG-85 NNER #O	.9 UTER #1	N N N N N N N N N N N N N N N N N N N	#STEER # #MOTOR #	* * I	* *	* *	۔ ۔
*	*	# Hd H	RPH #	*	RPH #	# Mdx	*	*	*	* Eda	RPM #	# Hd#	RPM #	RPN 4	RPM *	# HdX	# H d &	a a
111	#416511	TORQUE   TORQUE   TORQUE   TORQUE	TORQUE IT ftxlbs/f		TORQUE   TORQUE   TORQUE   ftx1bs   ftx1bs	TORQUE T  ftx16s1f	TORQUE IT ftx1bs1f	OR QUE! tx1bs1	ORQUE!T	TORQUE   TORQUE   TORQUE   TORQUE   TORQUE   TORQUE   TEXTOS   TEXTOS   TEXTOS   TEXTOS   TEXTOS   TEXTOS   TEXTOS	ORQUE!T txlbs!f	ORQUE!T txlbs!f	ORQUE!!	TORQUE   TORQUE   ftxlbs	TORQUE 1 T	TORQUE   TO	TORQUE LT ftxlbs/f	RQUE LTORQUE Klbs   ftxlbs
10.5	167.*	167.*	167.# 3525.#	7	2154.#	**	**0	\$.699	#.699	-334.#	-334.	**0	*	**0	*.0	••	**0	** D
- 5	201.1	5201.1 5201.1	254.1	-3.1	-3.1	1053.1	1053.1	1320.1	1320.1	-7.1	-7.1	3842.1	3842.1	-648.1	1060.1	8301.1	3414.1	-892.
12.0*	191.#	191.	191.* 4029.*	2462.	2462.	***	***	164.*	164.*	-382.#	-382.4	**	*	**0	*•0	**0	**0	0
-	576.1	4576-1 4576-1	224.1	-3.1	-3.	927.1	927.1	1161.1	1161.1	-6.1	-6.1	3380.1	3380.1	-570.1	932.1	7303.1	3004.1	-785.
	215.#	215.*	4533.*	2770.	2770.*	***	**0	860.	860.*	-430*	-430.*	*.0	**	**0	**0	0.	**0	0
-	4090.1	1-060+	200.1	-2.1	-2.1	828.1	828.1	1038.1	1038.1	-5.1	-5.1	3021.1	3021.1	509-1	833.1	6527.1	2685.1	-701.
15.0*	239.4	239.	239.# 5036.#	3078.	3078.	**0	**0	955.	955.	+ 814-	-478.#	***	*	***	**	**	*.0	0
	3701.1	3701.1	181.1	-2.1	-2.1	750.1	150.1	939.1	939.1	-5.1	-5.1	2734.1	2734.1	-461.1	154.1	5907.1	2430-1	-635.
16.5*	263.4	263.	263.4 5540.4	3386.	3386.*	*.0	*	1051.4	1051.*	-525-	-525.	**0	0.*	**0	*.0	••	*•0	•
-	3383.1	3363.1	165.1	-2.1	-2.1	685.1	685.1	858.1	858.1	1.4-		2499.1	2499.1	-421.1	689.1	5399.1	2221.1	-580.
18.0*	287.4	287.	287.* 6044.* 3693	3693.	3693.	*.0	**0	1146.	1146.	-573.4	-573.4	**0	•••	***0	0.*	*.0	•••	6
-	3118.1	3118.1	152.1	-2.1	-2.1	631.1	631.1	791.1	191.1	-;		2303.1	2303.1	-388.1	635.1	4976.1	2047.1	-535.
*	310.	*	4.17.8	4001.	4001.	**	***	1242.#	1242.#	-621.*	-621.	*.0		***	*.0	**	***0	.0
-	2878.1	2878.1	141.1	-2.1	-2.1	583.1	583.1	130.1	130.1			2126.1	2126.1	-358.	586.1	4593.1	1889.1	-494-
21.04	334.4		334.* 7051.*	4309.	4309.#	**0	***	1337.*	1337.*	+-695-	+-699-	**	**0	**0	0.*	**0	**0	0
7 -	2671.1	267'.1	130.1	-2.1	-2.1	541.1	541.1	678.1	678.1	-3.1	-3.1	1974.1	1974.1	-333.1	244.1	4264.1	1754.1	-458.
22.54	358.4	358.*	7555.	4617.	4617.*	*.0	*.0	1433.#	1433.*	-716.	-716.	**	**0	**0	**0	**0	**0	0
-	2493.1	2493.1	122.1	-1:-	-1.1	505.1	505.1	633.1	633.1	-3.1	-3.1	1842.1	1842.1	-310.1	1.805	3979.1	1637.1	-428.
24.0*	382.4	382.4	8058.	4924.	4924.*	<b>**</b> 0	0.*	1528.	1528.*	+-491-	-164.#	**0	**0	**0	*.0	**0	**0	0
-	2337.1	2337.1	114.1	-1-1	-1.1	473.1	473.1	593.1	593.1	-3.1	-3.f	1726.1	1726.1	-291.1	476.1	3729.1	1534.1	-401.
25.5	**90*	<b>*</b> 00*	8562.# 5232	\$232.	5232.	0.0	**0	1624.#	1624.	-812.	-812.	**0	**0	**0	0.	**0	0	*
_	2199.1	2199.	107.1	1		145.1	445.1	558.1	558.1	-3.1	-3.1	1624.1	1624.1	-274.1	448.1	3509.1	1444.	-377.
27.0*	430.4		430.# 9066.# 5540	\$540.#	5540.*	**0	***	1719.#	1719.4	-860.#	-860.	**	*	*	**0	**0		.0
-	2076.1	2076-1 2076-1	101.1	-1-1	-1.1	421.1	421.1	527.1	527.1	-3.1	-3-1	1534.1	1534.1	-259.1	423.1	3314.	1363.	-356.

GEAS	GEAR LOADS Max #Inner Veh #Sprok	DURING #OUTER #SPROK	MAXINUM TRACTI * PRDP *DUTER *MOTOR * B	* TRACT;	N # #	¥0.0 *00	RT CONDITION *OUTER *INNE * C * C	~	#OUTER #	RUN D #INNER # D	DATE:NO. #OUTER # E	* 7-AUG- *INNER * E	-8519 +0UTER * F		#INNER #S	#STEER #MOTOR	I * *	**	7	<b>x</b>	**	* *
#	*	# RPM	# RPM	# RPM	*	*	* # #	RP# #	RPM	* 20 *	# RPM	*	* 20	*	# # # # # #	E &	# RP M	•	R OR	α 4	# RP #	* E
	TORGUE	TORQUE  TORQUE  TORQUE  TORQUE     ftx1bs  ftx1bs  ftx1bs	TORQUE	11080U	ElTORQUE!	DE ITO	TORQUE   TORQUE   T	TORQUEIT	OR QUE tx 16s	TORQUE	TORQUE	I TORQUE!	El TORQUE siftxlbs		TORQUE! T ftx1bs1f	tx1b3	TORQUE    TORQUE	DE 1	TORQUE!	TORQUE TORQUE TORQUE	ElTORQU SIftx1b	QUE I
28.5#	28.58 454.8	454.3	454.# 9569.# 5848.	5848	*	* * * *	*	**0	1815.4	1815	* -907.	106- **	*	**	*	•	**0	*	••0	•	*	
i	1 1967.	1967.1 1967.1	1-96	-	_	-1:1	396.1	398.1	1.664	.664	1 -2.1	1 -2-1	-	453.1 1	453.1	-245.	104	-	3139.	1 1291	91.1 -3	37.1
30.0*		_	478.#10073.#	•	. 61	\$.95	**0	*.0	1910.*	1910.*	± -955	.* -955.		**0	**		*	*	**0		*	*
	! <b>_</b>	-		-1:	_	-1:-	378.1	378.1	474.1	474-	1 -2.	1 -2	. 13	80.1 1	380.1	-233-		81.1	2981.1	1226.	-1 -32	20.1
31.54	* 501.*		501.#10576.#	•	. 6463	3.*	*.0	*.0	**9007	2006.4-1	*-1003.*-1	*-1003.	*	**0	**	6		**0	0	•	*	*
	1 1779.	1719.1 1779.1	18	-1-	_	-1.1	360.1	360.1	451.1	451.1	1 -2.	1	.1 131	4.1	1314.1	-221.	1 362	-	2839.1	1168.1	1 -30	05.1
33.04	\$ \$25.4		525.#11080.#	* 6773.	.* 6771	11.*	**	**0	2101.#	* 2101.*	-1051	. 4-1051	*	**0	**0	•	**0	*.	**0		**0	**0
	1 1697.	1697.1 1697.1	1 63.1	-	_	-1:1	344.1	344.1	431.1	1.164	1 -2.	1 -2.1	.1 1254.1	•	1254.1	-211.	-	346-1	2709.1	1114.1	*	-291.1
*5.96	** 549.*		549.411584.4 7079.4	* 7079.	. 1019	* 6.	•••	**	2197.		2197.4-1099.4-1	*-1099	_	**0	**	•	*	*.	*	•	*	0.
	1 1623.	1623.1 1623.1	1.67	-1-	_	-1:-	329.1	329.1	412.1	412.1	1 -2.	12	.1 1199	11	99.1	-202-	.1 33	31.1	2591.1	106	6-1 -2	-278.1
36.04	£ 573.#		573.412087.4 7387.4	* 7387.	. 1387	17.4	*.	**	2293.		2293.4-1146.4	*-1146.*		*.0	**	•	*	*.0	**		*.	*.
	1 1555.	1555.1 1555.1	1.97	}	_	-1.1	315.1	315.1	395.1	395.1	1 -2.	1 -2-1	114	9.1 11	1.64	-194.	!_	317.1	2482.1	1021.1	•	-267.1
37.54	\$ 597.4	- 1	597. 12591. 4 7695.	* 7695.	* 76	95.4	*.0	0.4	2388.4	× 2388.4-	*-1194.	-1194	*	**0	**0			*	••		*	**
	_		13.1	-1.	_	1:1	302.1	302.1	378.1	378.1	1 -2.	_	2.1 1101	-	11011	-186.	_	304.1	2378.	978.1	•	-256.1
39.0#	<b>*</b> 621.*	- 1	621.#13095.#	* 8002.1	* 8002	**2	**0	**0	2484.*	2484.4-1	242	.+-1242	*	*	**0	•	*	*.	••		*	**
	l	1430.1 1430.1	1.07	!	_	-1:1	290.1	290.1	363.1	363.1	1 -2.1	1 -2.1	12	56.1	056.1	-178.	7	91.1	2282.	938.	11	245.1
40.54	* 645.*	- 1	645.413598.4	* 8310.	<b>8310</b>	**0	**0	**0	2579.*	2579.	*-1290.*-1	290	•	*	***	•	*	**	0	•	*	*.0
	1 1374.1	1374.	İ		-	-1.1	278.1	278.1	349.1	349.1	1 -2-1	-2	.1 1015.	.1 10	15.1	-171.	_	280.1	2192.1	206	.1 -2	-236.1
45.0#	* 699 *		669.#14102.#	•	* 8618	*	*.	**0	2675.	1 2575.4-1	337	.4-1337.	•	*:	*.	•	*	**	*.		**0	**
		1322.1 1322.1	1 65.1	1 -1.	_	-1.1	268.1	268.1	335.1	335.1	1 -2.	1 -2.	.976 1.	_	976.1	-165.	7	69.1	2109.1	898	-1 -2	227.1
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248.1 -51.1 -51.1 -275.1 -275.1 684.1 684.1 -71.1 -71. 3638.4-4787.4-4787.4 0.4 0.4 1318.4 1318.4-1734.4-1734.
235-1 -49-1 -49-1 -261-1 -261-1 648-1 648-1 -67-1 -67-
3820.#-5027.#-5027.# 0.# 1384.# 1384.#-1821.#-1821.# 223.  -46.  -46.  -248.  -248.  616.  616.  -64.  -64.  -
4002.*-5266.*-5266.* D.* D.* 1450.* 1450.*-1908.*-1908.*
212.1 -44.1 -44.1 -235.1 -235.1 585.1 585.1 -60.1 -60.1 -649 4184.0-5505.4-5505.4 0.4 0.4 1516.4 1516.4-1995.4-1995.4 0.
202.  -42.  -42.  -224.  -224.  557.  557.  -58.  -58
4366.4-5745.4-5745.4 0.4 0.4 1582.8 1582.4-2081.4-2081.4 0. 192.1 -40.1 -40.1 -214.1 -214.1 531.1 531.1 -55.1 -55.1 -589
4548.4-5984.4-5984.¢ 0.\$ 0.\$ 1648.¢ 1648.4-2168.4-2168.\$ 0.\$
183.  -38.  -38.  -204.  -204.  506.  506.  -52.  -52.  -561  4730.*-6223.*-6223.* 0.* 0.* 1714.* 1714.*-2255.*-2255.*
175.1 -36.1 -36.1 -195.1 -195.1 484.1 484.1 -50.1 -50.1 -537
4912.8-6463.4-6463.4 0.4 0.4 1780.4 1780.4-2342.4-2342.4 0.4
167.  -35.  -35.  -186.  -186.  462.  462.  -48.  -48.  -513 5094.4-6702.4-6702.4 0.4 0.4 1845.4 1845.4-2428.4-2428.4
1 -33.1 -176.1 -178.1 442.1 442.1 -46.1 -46.1 -4
5275.4-6941.4-6941.# 0.# 0.# 1911.# 1911.#-2515.#-2515.#
153.1 -32.1 -32.1 -170.1 -170.1 423.1 423.1 -44.1 -46.1 -46.
5457.4-7181.4-7181.4 0.4 0.4 1977.4 1977.4-2602.4-2602.4
147.1 -30.1 -30.1 -163.1 -163.1 405.1 405.1 -42.1 -42.1 -450

RUN DATE: 20-AUG-85:109

INPUT DATA:

GROSS VEHICLE WEIGHT, tons = 40.0 TRACK PITCH, in. = 7.63

45.0 MAXIMUM VELDCITY; mph. = 45.0 NUMBER OF SPROCKET TEETH = 11

= 880.0

ENGINE NET. HP.

THIN DRIVE MOTOR SET-UP CONFIGURATION I # # Efficiency data for Westinghouse induction motor by Craig Joseph 10-MAY-85

19. 38. 76. 57. 1762. 6114. 4529. 3242. 2070-113. 2532. 94 TORQUE ftlbs # OUTER RPK Ħ 38. 19.# \$1.4 4.91 113.\* 4525.1 # \* 76 1761. 3239. 6109. 2529.1 2068-1 I TORQUE ftlbs # INNER RPH 87.4 # 174.4 2891.1 2142.1 262.# 349.4 436.# 523. 833.1 1533. 1197.1 979. TORQUE ftxlbs OUTER RPX w # 87.4 # 1533.1 174.4 2891.1 2142-1 262.# 340.4 436.4 979.1 523. 833.1 1197.1 TORQUE ftxlbs INNER **2**02 ш Ħ # -33.\* -67.\* -100.4 -133.# -167.\* -10255.1 -200--30292. -16062. -22436.1 -12542.1 TORQUE ftx1bs DUTER C & D RPA # -33.# --67. -100.4 -200°\* -22436.1 -133.4 -167.¢ -30292. -16062. -12542. -10255.1 -8730.1 TORQUE ftxlbs # INNER # C & D R P K -121.4 -364°# -245.4 **-**909--9013. -6576.1 -485.4 -727--2598.1 -3051. -4779-1 -3732. TORQUE ftxlbs OUTER R P X 0 Ħ -121.4 -242. **-364.** -485. **+•**909– -727. -9013.1 -6676.1 -4779--3732-1 -3051.1 -2598. ftxlbs TORQUE INNER RPM ø # # 395.# 1976. 780.1 2705.1 790.\* 1186.\* 1581.4 2371.\* 2003.1 1434.1 1120.1 916. TORQUE ftxlbs # MOTOR=A \* OUTER RPM # 2004.1 395. 1136.4 2706.1 **790.** 1581.\* 1976.4 2371.\* 780.1 1435. 1120.1 916. MOTOR=A ftxlbs TORQUE # INNER RPM 41 # 19. # 8 F 57.¢ 76. 4.46 113.\* 53424-39569-28328. 22120 18085. 15397.1 TORQUE ftx1bs SPROK OUTER RPH ₩ 41 # 19.\* 38. 57. 4.91 4.46 53424. 113. 39569.1 15397.1 28328.1 22120.1 18085. TORQUE ftx1bs INNER RPH B-82 MAX # Ħ 44 4.54 **\*0**•9 7.5# 9.0₩ VEH MPH

OUTER F	RPM	TORQUE ftlbs	132.	1538.	151.	1353.	170.	1209.	189.	1094.	208	1000.	227.	922.	246.	851.	264.	790.	283.	737.	302.	691.	321.	650.	340.	614.
INNER # 0	RPM #	TORQUE   T ftlbs	132.#	1537.1	151.#	1352.1	170.*	1208.1	189.#	1094-1	208-#	1000-1	227.*	921.1	246-#	850.1	264.*	189.1	283.#	737.1	302.≄	690-1	321.#	650.1	340.*	613.1
* *	*		611.#	727.1	698.#	640.1	785.#	572.1	872.#	518.1	<b>**096</b>	473.1	047.	436.	1134.#	402.1	1221.*	374.1	1308.	349.1	1396.#	327.1	1483.#	308.1	1570.*	1-062
r OUTER	R P R	TORQUE	1							_		_			1	_	1			_	*	_	#		. #	_
INNER #	RP K	TORQUE   ftx1bs	611.*	127.	<b>4.869</b>	640-1	785.#	572.1	872-#	518.	<b>**096</b>	473-	1047.	436	1134.#	402-	1221.*	374.	1308.	349.1	1396-	327.1	1483.	308-1	1570.	290-1
##	#		233.*	7620.1	266.#	6704.1	300.≄	5992.1	333•≉	5422.1	-366.#	1.9564	4°00+	4568.1	-433°#	4216.1	-466.#	914.1	-500-#	652.1	-533.#	424.1	-566.*	3222.1	500	-3042.1
09 DUTER C & D	RPM	TORQUE ftxlbs	-2	-76	-2	19-	- 3	-59	1	-54		-49	<b>7</b> -	4.		74.		-39		- 3	1	F -		-37	1	-3(
20-AUG-85:109 INNER # C & D #	RPM ₩	TORQUE   ftxlbs	-233.#	-7620-1	-266.*	1-9019-	+300 -	-5992.1	-333•#	-5422.1	-366-	-4956-1	-400-	-4568.1	-433.#	-4216.1	-466.	-3914.	-200-	-3652.1	-533•≉	-3424.	-566.	-3222-1	<b>+*009</b> -	-3042-1
# #	*		848.#	2267.1	970.#	-1995.1	1091.*	-1783-1	-1212.*	513.1	-1333.#	-1475.1	-1454.#	359.1	-1575.	-1254.1	-1697.	-1165.1	-1818.#	-1087.1	-1939.#	-1019.1	2060.#	1-656	2181.4	1-506-
RUN DATE:No. # Duter # B	# RPM	i Torque i ftxlbs	*	-	#	_	<b>1</b> -	_	#	1 -1	#		*	-1	#	-	#	_	#	_	#	-	1	-	1	_
R INNER B	RPM	TORQUE ftx1bs	-848-	-2267.	-970-	-1995.	-1001-	-1783.	-1212.	-1613.	-1333.	-1475.	-1454.	-1359.	-1575.	-1254.	-1691-	-1165.	-1818.	-1087.	-1939.	-1019.	-2060.	-656-	-2181.	-905-
CONDITION F OUTER # F MOTOR=A #	RPH #	TORQUE 1 ftxlbs 1	2766.#	680.1	3162.4	1.665	3557.	535.1	3952.#	484.1	4341°#	443.1	4743.	4.08.1	5138.	376.1	5533.4	349.1	5928.#	326.1	6323.#	306.1	6719.	288-1	7114.*	272.1
<b>⊢</b> ""	#		2766.#	681.1	3162.*	1-669	3557.#	535.1	3952.#	484.1	4347.#	443-1	4743.\$	408-1	5138.#	377.1	5533.#	350-1	5928.#	326.1	6323.#	306.1	6719.#	288.1	7114.#	272.1
	# CO	1 TORQUE	*	-	#	-	#	-	#	-	#	-	#	-	#	-	*	-	*	-	*		*	-	*	-
MAXIMUM TRACTIVE # DUTER # IN # SPROK # MOT	RPM	TORQUE ftx1bs	132	.13439	151	11824	170	10568	189	9563	208	8741	227	8056-	246.#	7436-1	264	6903	283.#	6442	302	6038	321	5682	340	5365
LOADS AT HAX: INNER #	RPM ₩	TORQUE   ftx1bs	132.4	13439-1	151.*	11824-1	170.#	10568-1	189.	9563.1	208.	8741.1	227.	8056.1	246.#	7436.1	264.*	6903.1	283.4	6442-1	302.	6038.1	321.4	5682.1	340.4	5365-1
GEAR LO Max # Veh #	# Hd#		10.5	-	12.0	-	13.5≑	-	15.0#	-	16.5	-	E	3-83	3	-	21.0	-	22.5	-	24.0#	-	2.5.5	-	27.0*	-

	OUTER F	æ 0.	TORQUE	359.	582.	378.	552.	397.	526.	415.	502.	434.	480	453.	460	472.	441.	491.	423.	510.	+00+	529.	391.	548.	377.	567.	363.
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	INNER	R P X	TORQUE ftlbs	359.	581.1	378.4	552.	397.#	526.1	415.	502.1	434.#	480.1	453°#	460.1	472.#	440-1	491.4	422.	510.#	406.1	529.	391.1	548.	376.1	567.	363,1
	##	#		#	-	#	-	#	-	#	_	#	_	#	-	#	-	#	_	#	_	#	_	#	_	#	_
	OUTER E	RPH	TORQUE	1657,	275.	1745.	261.	1832.	249.	1919.	237.1	2006.#	227.1	2094.	218-	2181.	208.	2268.	200.1	2355.*	192.1	2445.	185.1	2530.	178.1	2617.‡	172.
	##	#		*	-	#	-	#	-	#	-	#	_	#	_	#	_	#	-	45	_	#	_	#	-	##	-
	INNER	RPA	TORQUE ftx1bs	1657	275.	1745.#	261-1	1832.#	249.1	1919.	237.	2006.#	.227.1	2094.	218-1	2181-#	208.	2268.*	200-	2355.	192-1	2442.	185.	2530.	178.1	2617.	172.1
	##	#		*	-	#	-	*	-	#	-	#	-	#	-	*	-	#	_	#	_	#	_	*	_	#	_
	9 OUTER C & D	S.	TORQUE	-633	-2881	-666	-2737.1	<b>**669</b> -	-2606	-733,	-2487.	-766.	-2378	-799.	-2279	-833	-2183.	-866	-2094	-899-	-2013.	-933.	-1936.	•	-1866.	-666-	-1800.1
	# #	*		#	-	#	-	#	-	#	-	**	-	#	-	#	-	#	ļ —	#	_	#	_	#	_	#	-
	20-AUG-85:109 INNER # C & D #	R P M	TORQUE ftx1bs	-633	-2881	999-	-2737.1	669-	-2606-	-733	-2487	-766	-2378	-199	-2279.1	-833.	-2183	-866.	-2094	-868-	-2013.1	-933	-1936.	<b>**996</b> -	-1866.	<b>**666-</b>	-1800.1
	* # #	#		*	-	#	-	#	-	#	-	#	_	#	_	44	_	#	  -	#	_	#	_	#	_	#	_
	DATE:No. OUTER B	RPM	TORQUE ftx1bs	-2303.	-857.	-2424.	-814.	-2545.	-775-1	-2666.#	-740-	-2787.#	-708	-2909-	-678.	-3030*	-650.1	-3151.	-623-	-3272.	-599.1	-3393.	-576-	-3515.	-555.	-3636.	-535.1
	2 2 # #	#		#	_	#	_	#	_	#	_	*	_	#	_	#	<b> </b> _	#	_	#	_	45	_	*	_	ж	_
	INNER	RPM	TORQUE ftxlbs	-2303-	-857.	-2424-	-814.	-2545.	-775.	5666.#	-140-	-2787.	-708-	-2909.	-678-	-3030.	-650-	-3151.	-623.1	-3272	1-665-	-3393.	-576-	-3515.	-555-	-3636.	-535-
	**	#		#	-	#	-	#	-	#	-	*	-	#	-	#	-	#		#	_	#	_	#	-	#	_
	CONDITION: DUTER HOTOR=A	RPR	TORQUE ftx1bs	7509.	257.	7904	244	8299	233	8695	222	9090	212	9485	203	9880	195.	10275.	187.1	10671.	180.	11066.	173.	11461.	167.	11856.	161.
	* *	#		#	57.1	#	-	#	-	#		*	-	#	-	#	-	*	7	*	-	*	-	*	-	#	-
	TRACTIVE EFFORT R # INNER K # MOTOR≖A	RPA	TORQUE ftx1bs	7509.	257	7904	744	8299	233	8695	222	0606	212	9485	204-1	9880	195	10275	187	10671	180	11066.	173.	11461-	167.	11856.	161.
	(CT)	*		#	-	*	-	#	7	#	-	#	-	*	-	*	-	#	-	*	-	*	-	*	_	#	<del>-</del>
	MAXIMUM TR/ # DUTER # SPROK	RPM	TORQUE ftx16s	359	5082	378.*	4826	397	4596	615	4386	434	4194	453	4019	472	3850	491	3694	510,	3549,	529.	3415,	548	3290.	567.	3174.
	X	*		#	-	*	-	#	-	*	-	*	-	#	-	#	-	*	-	*	-	#	. —	#	_	#	_
·	OADS AT Inner Sprok	RPM	TORQUE ftx1bs	359	5082	378	4826	397	4596	415	4386	434.	4194	453	4019	472.	3850.	491.	3594.	510.	3549.	529.	3415.	548.	3290.	567.	3174.1
	GEAR L Max # Veh #	# Hd#		28.5#	-	30.0#	-	31.5	-	33.0*	-	34.5	•	B-8	34	# C • • ·		39.0*	-	40.5	-	42.0#	<u>.</u>	43.5*	•	45.0	-

HT. tons = 40.0 MAXIMUM VELUCITY, mph = 45.0  17.453  17.453  17.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453  18.453	: 45.0 ENGINE NET HP. = 880.0 4 = 11 14 = 14
ELGHT, tons = 40.0 NAXIHUM VELOCITY, mph = 45.0 ENGINE NET HP, = 880.0  NUMBER OF SPROCKET TEETH = 11  for Mestinghouse induction motor = CONFIGURATION IS  JOSEPH 10-HA-85  NUMBER OF SPROCKET TEETH = 11  for Mestinghouse induction motor = CONFIGURATION IS  JOSEPH 10-HA-85  NOTOR = 8	: 45.0 ENGINE NET HP. = 880.0 1 = 11 14 = 14
## FOR Westinghouse induction motor # PROPULSION/STEER MOTOR SET-UP ### PROPULSION/STEER MOTOR SET-UP ### PROPULSION/STEER MOTOR SET-UP ### PROPULSION/STEER MOTOR SET-UP ### PROPULSION/STEER MOTOR SET-UP ### PROPULSION/STEER MOTOR SET-UP ### PROPULSION/STEER MOTOR SET-UP ### PROPULSION/STEER MOTOR SET-UP ### PROPULSION/STEER MOTOR SET-UP ### PROPULSION/STEER ### ## ## ## ## ## ## ### ### PROP ### ## PROPULSION/STEER ### ## ### ### ### PROP ### ## PROPERTY ### ### ### ### ### ### PROP ### ## PROPERTY ### ### ### ### ### ### PROP ### ## PROPERTY ### ### ### ### ### ### PROP ### ### ### ### #### #### ####	
### PROP #DUTER #INNER #OUTER #INNER #OUTER #INNER #OUTER #INNER #STEER # # # J ### ### ### ### ### ### ### ##	MOTOR
### ### ### #### #### #### ###########	Societation de la la la la la la la la la la la la la
243.* 0.* 0.* 76.* 76.* -38.* -38.* -32.110821.110821.11356.113556.113556.1 -67.1   487.* 0.* 0.* 151.* 151.* -76.* -76.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.* -75.	RPK & RPK & RPK & RPK & RPK &
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GEAR VEXX	GEAR LOADS DURING Max tinner touter Veh tsprok tsprok		4AXIMUM TRACTIV * PROP #OUTER # #MOTOR # 8 *	2 * *	E EFFO INNER		CONDITION Ter #inner C # C	#3UTER # D	AINNE	DATE R #OU	• • • •	14-AUG-85; Inner #Dut F E # F	5;110 UTER #] F #	IN TER	#STEER #	I	¬ * *	* *	**	
MPH # RPH	MPH # RPH # RPH		# MPH #	# RPM #	E C	# #	* RPM	# RPR	# # P	*	*	# # #	RP A	A M	S P	# KPK	* 20 %	#	# E	A M
	TORQUE!	ITORQUE  TORQUE  TORQUE      ftxlbs  ftxlbs  ftxlbs  ftxlbs	TORQUE   ftx1bs1		TORQUE	TORQUE		1108 QU	EITORQUE siftxibs	UE I TOR bs I f tx	TORQUE!TORQUE!TORQUE!TORQUE! ftxlbs!ftxlbs!ftxlbs!ftxlbs!	RQUEIT xlbs#f	ORQUE!	TORQUE! TORQUE ftx1bs1ftx1bs	TORQUE	TORQUE   ftx]bs	TOROU	E110	RQUE IT	ORQUE
10.5#	132.	10.5# 132.# 132.# 2788.# 1704.#	2788.*	1704.8	1704.	0	.0	* 529.*	.\$ 529.		- \$-\$92	-264.#	**0	**0	•••	•	*	**0	*•	••0
	13153.	113153-113153-1	642.1	-8-	-9-	1 2664.1	7997	.1 3338.1	.1 3338.1	!	-16.1	-16.1	9717.1	9717-1	-1638.	1 2680-120	120992	2.1 86	635.1-	2256.1
12.0#	12.0# 151.#	151.*	151.4 3186.4 1947.4	1947.1	1947.	•	.0	*** 604.	** 604	*	302.4 -	302.4	0.*	*•	•	****		*.0	*.0	*.0
!	11572.1	111572.111572.1	565.1	-1:-	-1.	1 2344.1	2344	.1 2936.	.1 2936	-	-14.1	-14-1	8549.1	8549.1-	-1641.1	2358	.11847	470.1 7	-1.7657	1985.1
13.54	170.	170.	3585.	2191.4	2191.	•	•	.* 680	. 680.	#	340*# -	340.#	*.0	**	***	***		***	*.	0.*
_	110343.1	10343.1	505.1	-9-	-6.1	1 2095.1	2095	1 2625	.1 2625	-	-13.1	-13.1	7641.1	7641.1	-1288-	1 2107.11	650	8.1 67	190.1-	1774.1
15.0*	189.		189.4 3983.4 2434.4	2434.8	2434.1	****		0.# 755.	.* 755	*	- #*84	378.4	0.*	0	_	**0		**	••	••
-	9360.1	1 9360-1 9360-1	9360.1 457.1	-6-1	-6.1	1 1896.1	1 1896-1	23.75	.1 2375	-	-12.1	-12.1	6915.1	6915.1	-1165.	11.7061	493	9.1 61	145.1-1	1605.
16.5#	208.4	208.	4381.	4381.4 2677.4	2677.	*	**	# 831	.* 831.	#	415.4 -	415.4	*.0	0.*	••	**0		**0	**	**0
-	. 40		418.1 -5.	-5.1	.5.	1 1733.	1733	.1 2171.	.1 2171	-	-11-1	-11:1	6320.1	6320-1-	-1065.	1743.	.113655	-	5617.1-	1467.1
18.0*	227.*	. 227.*	4779.		2921.	0	•	906 **0	906 **	*	453.4 -	-453.*	*.0		**	***		**0	**	•
•	7885.1	-		-5.1	-5.	1 1597.1	1597	.1 2001	.1 2001	-	-10.1	-10.1	5825.1	5825.1	-982-1	1607-11	25	85.1.58	-1.7718	-1352.
19.54	19.5# 246.#			5178.4 3164.4	3164.4	**0	•	.* 982.	*	<b>*- **286</b>	91.* -	491.*	*.0	0.*	**	***		**0	**0	•
-	1277.1		355.1	7	i	1474.	1474	.1 1847.	1 1847	7.1	-9.1	-9-1	5376.1	5376.1	-906-	1 1483.	111161	5.1 4	-1.811	1248.
21.0*	264.4	264.		5576.4 3408.4	3408.	*****	0	.* 1058	.* 1058.	*	- **625	529.*	•••	0.	••	* 0		*.0	•	6
-	6756.1	6756.1 6756.1	330	1.4.	-;	1.368.1	1368	.1 1714.	121	-	-8-	-8-	4991.1	4991.1	-841.1	1377	.11078	83.1 44	36.1-	1159.
22.5*	283.#	283.4	\$974.		3651.	***0 *	•	.* 1133.	.# 113	3.4 -5	- **19	567.	**	0.*	•••	•	*	<b>*•</b> 0		*.0
-	6305.1	6305.1 6305.1	308.1	7	÷	1 1277.1	1211	.1 1600.	.1 1600	-	-8-	-8-	4658.1	4658.1	-785.1	128	5.110062.1	ŀ	4139.1-1	1081.
24.0#	302.		302.* 6373.* 3894.*	3894.4	3894.*	***	•	.* 1209.	.* 120	- #•6	+***09	***09	••	0.*	*.0	***		**0	**	6
_	\$909.1	5909.1 5909.1	289.1	-3.1	-3.	1.197.1	1197	.1 1500,	1 1500	-	-7.1	-1-1	4366.1	4366.1	-736.1	1204.1	1 9432	2-1 38	8	.1-1014.
25.5#		321.	6771.#	4138.4	4138.4	* 0 *	•	. 1284.	.* 1284	9- ***	45.# -6	642.#	**0	0.	**0	**0		**0	•••	0
_	5561.1	5561.1	272.1	-3.1	-3.	1 1126.1	1126	=	.1 1411	-	-7.1	-7.1	4108.1	4108.1	-692.1	1133.	1 887	5.1 3	651.1	-954.
27.0*		340.# 340.# 7169.# 4381.#	7169.#	4381.	4381.	***0	•	.* 1360.	. 1360	9- #-0	- #*08	**089	*	•	**0	•	*	**0	.0	**0
_(	5251.1	1 5251.1 5251.1	256.1	-3.1	-3.1	1 1063.1	1 1063.1	1332	.1 1332.	_'		-1:-	3879.1	3879.1	-654-1	10701	1 8380.1		-	901.1

**	*	TORQUE! ftx1bs1	**	53.1	**0	810.1	***	172.1	#.0	136.1		704.1	**0	15.1	*	46.1	**0	20.1	**	96.1	*	573.1	**0	52.1	**0	33.1
<u>ب</u> ند ند	~	110R		6-1		<u> </u>		_		-	*	_		9-	*	9- 1.	*	9- 1	*	5	*	<u> </u>	*	1 - 5	*	1 -5
	I	R QUE x 1 b s	*	3265.	**0	101	**	953.	**0	2818.	•	695.	•	582.	•	14:		373.	ċ	281.	**0	194.	6	114.	0	1.6602
**	<b>₩</b>	22	*	-	*	3	*	~	*	-	*	7	*	1 2	*	7	*	7	*	- 7	٠	1 21	*	1 21	*	_
-	I	TORQUE ftx1bs	•	938.	0	539.	•	179.	•	8 51.	•	552.	**0	6278.	•	6014.	ė	770.	•	544.	•	335.	•	\$140.	0	958.
**	*		*	-	**0	-	***		*	-	*	-	*	-1	*	-	*	5	*	- 2	*	- 5	*	-	*	-
I	α 4	ORQUE tx1bs	ò	1013	0	962.1	0	916.1	0	875	0	826.	•	801	•	768	0	737.	•	100	•	681	0	959	0	633
* *	#	==	#	-	*	-	*	-	*	-	*	-	*	90.1	*	69.1	*		**	3.1	*		*	=	**0	=
*STEER *MOTOR	Z P	TORQUE	0	-619	0	-588	•	-560		-535	0	-511	٥	64-	Ŭ	9	Ū	-45		-43	Ū	1		0		-387
	#	UE 17	*	_	# 0	-	<b>#.</b> 0	3.1	\$ · 0	1.1	*	3.1	*	1.9	**	;	*.0	1:-	*	-	*	1.69	**	6	**0	5.1
INNER F	R P R	TORQUE ftx1bs		3674.		3490		332		317		303		2906		278		2571		256		7.7		237		2295.
10 # #I	*		**	74.1	*	-	**	23.1	**0	1:-		33.1	*	06.1		84	*	1:1	•	66.1	**	1.69	**	1.61	**0	1.56
85:1 00TE	æ 0-	<del>  -</del>	_	36	_	3490		33	_	3171		30		53	_	27	_	2671		52		7.		23		622
-AUG-85:11 Ner #OUTER E # F	*	txlbs	718.	-6.1	755.#	-6.1	793.#	-6-1	31.4	-5.1	#*69	-5.	**906	-5.1	***	-5:1	82.*	-5.1	020.	7	058.*	1.4-	**560	7	33.	
14- 114- 118-	# G		L- *	_	4 -7	_	1	_	# #	_	80 #	_	4	_	6- #	_	6- *	_	1-1	_	-#-10	_	+-1	_	#-11	_
• e	X C	ORQUE!	718.	-9-	755.	-6.	793.	-9-	831.	-5.	869.	-5.	906	-5.	. 776	.5	982.	-5.1	020	7	058.	†	095.	÷	133.	÷
ATE:	æ	==	*	-	*	_	#	_	#	-	*	-		_	*	-	•	-	-	-	1-4.	-	-#-	-	. 4-1	-
RUN D #INNER # D	E G	OROUE	435.	1262.	511.	1199.1	586.	1141.	1662.	089.	737	042-	813.	998.	889	956.	***96	11	2040-	881	2115	848	2191	817.	2266.	882
# # IN	*	E   1	**	-	.*	-	4	-	*		*	-	.* 1	-	89.* 1	-	*	-		-	*	-	#	-	*	-
UTER	A P A	108 QU ftx 1b	1435	1262	1511	1199	1586	1141	1662	1089	1737	1042	1813	998.	1889	956	1964	917.1	2040.	881	2115.	8 + 8	2191	817	2266	788
* * 0UT(	*	DE P	*	1:1	*.0	7:-	**0	-	#*0	9.	**	31.1	*.0	197.1	*.0	63.1	*	132.1	**0	10401	**	677.1	*	2 . 1	**0	1-62
TION	2 P.	1080 11x1		100		95		911	- 1	86		83		ì		18		73		!		6.1		69		62
CONOI	#	UE 1 bs 1	*	1.70	*	57.1	*.	911.1	0.	1.69	**	31.1	*	•	*	63.1	0.*	32.1	*	1.40	**	11.1	*.0	52.1	0.4	1-62
# 0 C C	* RP	T080	*	1001	*	6	*	6		<b>E</b>	*	80	*	1	*	_		-	*	_	*	9	*	۰		9
F F 0	x	RQUE	625.1	-3.1	868.1	-3.	11.	-3.	355.	-3.	598.1	-2.	42.	-2.1	085.1	-2.	328.*	-2.1	572.	-2-	815.	-7.	059.	-2.1	302.*	-2.1
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S		00E1	359.	4973.1	78.	724.1	397.4	4498.1	415.4	4293.1	434.4	4105.1	453.	933.1	4.22.	58.1	4.164	15.1	\$10.	74.1	\$29.*	1343.1	548.4	220.1	567.#	1.90
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GEAR LOADS MAX #INNER VEH #SPROK	# HdH		28.5*	_	30.0	-	31.54	_	33.0*	_	34.54	-	36.0#	_	37.5#	_	39.0*	_	40.5	_	42.0	-	43.54		<b>42.0</b>	
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6 1 1 4 - A		0 E	= =	ACCEPTOR	H RPH	QUE LTOR 15s)ftx	-189.#	13.1-70	-379.*	48-1-56	-568.	42.1-39	\$7.4	71.1-30	+*946-	69.1-25	36.#
nich Comiss Zun Date: 14. Ketetetet		= 45.0 [H = 11 :*****	TGURAT DRIVE	Seeses	# RPH	UE TOR	-189.4 -1	3.1-13	-379.4 -3	8-1-10	*	-742.1 -7	-757. # -757	-571.1 -5	-6- #*9+6-	-469.1 -4	863.#-1136.#-1136.#
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	<b>:</b>	WEIGHT, n. = 7,	cy date Siedler	****** INNER MOTOR	a e	TORQUE	396.	-809-	- 1		- 1		1582.	-352.	1978.	-289.	2374.
	INPUT DATA:	EHICLE ITCH, 1 ******	Efficiency data for Homby Gene Siedler 20-MAY-	***** *OUTER* *SPROK*	* 202	TORGUI	19.8	1484121	38.4	1386551	\$ 57.4	1273491	* 76.*	121056	***6	1172851	113.4 113.4 2374.4 2374.4
		GROSS VEHICLE MEIGHT, tons a TRACK PITCH, in. a 7.63	<u>مَ</u> س	esessessessessessessessessessessessesse	MON 4 MON 4 MON 4 MON	TORQUE! TORQUE   TORQUE	1.5# 19.# 19.# 396.# 396.#	148413.1484121	3.04 38.4 38.4	138656.1386551	4.54 57.4 57.4	127349.1273491	6.0# 76.# 76.# 1582.# 1582.#	121057-121056	7.54 94.4 94.4 1978.4 1978.1	117285.1172851	9.0¢ 113.¢ 113.¢
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T CONDITION RUN DATE:NO. 14-AUG-95:108 R & DUTER & INNER & DUTER & INNER & CUTER & TNNER & CUTER 4 A & 8 & 6 & C & C & D & D & E & E & F & F & F & F & F & F & F & F
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58.# 2158.#-2839.#-2839.# 0.# 0.# 782.# 782.#-1029.#-1029.
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54.   754.   -156.   -156.   -838.   -838.   2082.   2082.   -215.   -215.
46.# 2446.#-3218.#-3218.# 0.# 0.# 836.# 886.#-1166.#-1166.
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61.1 46.1 50.1 GEAR LOADS AT MAXIMUM TRACKTIVE EFFORT MAX #INNER #DUTER# INNER #DUTER #INNER VEH #SPRDK #SPRDK# MOTOR #MOTOR # A -76.1 -76.1 -55.1 -55.1 1.64- 1.64--73-1 -73-1 -58.1 -58.1 -53.1 -53.1 1.99- |.99-1.09- |.09--81.1 -63.1 -63.1 -51.1 -69--81.1 -69-1 -51.1 359.4 359.4 30.04 378.4 378.4 1 4577.1 45761 397.4 397.4 4352.1 43511 33.0# 415.# 415.# 434.# 434.# 1 3945.1 39451 36.04 453.4 453.4 37.54 472.4 472.4 1 3444.1 34441 12.04 529.4 529.4 2914.1 29141 1 4139.1 41391 1 3766-1 37661 1 3598.1 35971 1 3298-1 32981 1 3161.1 31601

#### B.3 Regeneration In Steering

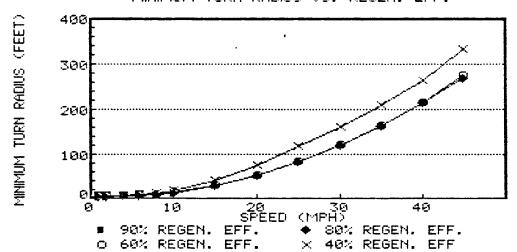
The effects of regeneration efficiency on steering performance were studied to quantify significance on this factor. The following curves illustrate the results of this study. The 19.5 ton vehicle parameters were used. The propulsive efficiency of the drive was based on the homopolar system, which is only slightly lower than the induction motor systems. Regeneration efficiency was varied as noted to determine the effects.

- 1. Figure B.3-1: These curves show that regeneration efficiencies of 60% or better will provide the same minimum turn radius.
- 2. Figure B.3-2: These curves show that regeneration efficiencies of 60% or better will provide the 0.5 G. lateral acceleration that is desirable for evasive maneuvers.
- 3. Figure B.3-3: These curves show that power requirements in turns decreases with improved regeneration efficiency, which will reduce fuel consumption.
- 4. Figure B.3-4: These curves show that improved regeneration efficiency increases outer sprocket maximum loads, potentially increasing the required size of motors and related gearing.
- 5. Figure B.3-5: These curves show that regeneration horsepower is constant with regeneration efficiencies of 60% or greater.
- 6. Figure B.3-6: These curves show regeneration efficiency indirectly changes scrub horsepower due to more scrubbing in the sharper turn.
- 7. Figure B.3-7: These curves show the effect of sharper turns on regenerated horsepower at 90% regeneration efficiency and that the resulting higher powers impose greater loads on system components.

The conclusion from the data provided by these curves was that regeneration efficiencies of 60% or better would provide satisfactory performance. Since all recommended drives provided the desired level of regeneration efficiency, this characteristic did not become a factor for discriminating between the various drives.

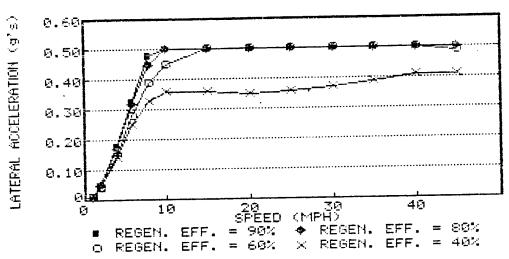
X Data	90% REGEN. EFF.	80% REGEN. EFF.	60% REGEN. EFF.	40% REGEN
1	5.28	5.48	5.88	6.29
2	5.31	5.50	6.06	6.62
4	6.06	6.38	7.02	7.86
6	7.20	7.61	<b>8.</b> 58	9.81
8	8.84	9.46	10.97	12.98
10	13.40	13.40	14.88	18.59
15	30.15	30.15	30.15	41.54
20	53.40	53.60	53. <b>6</b> 0	76.43
25	83.75	83.75	83.75	117.64
30	120.60	120.60	120.60	161.86
35	164.15	164.15	164.15	209.92
40	214.40	214.40	214.40	263.90
45	271.35	271.35	276.64	332.37

### MINIMUM TURN RADIUS VS. REGEN. EFF.



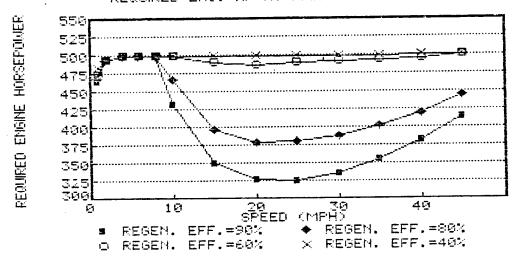
X Data	REGEN. EFF. = 90	% REGEN. EFF. =	80% REGEN. EFF. =	60% REGEN. EF
1 2 4 6 8 10 15 20 25 30 35 40 45	0.01 0.05 0.18 0.33 0.48 0.50 0.50 0.50 0.50 0.50 0.50	0.01 0.05 0.17 0.32 0.45 0.50 0.50 0.50 0.50 0.50	0.01 0.04 0.15 0.28 0.39 0.45 0.50 0.50 0.50 0.50 0.50	0.01 0.04 0.14 0.25 0.33 0.36 0.35 0.35 0.37 0.37 0.41

## MAXIMUM LATERAL ACCELERATION



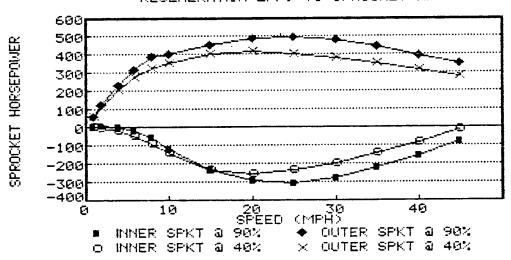
X Data	REGEN. EFF.=907	REGEN. EFF.=80%	REGEN. EFF.=60%	RESEN. EFF.=40%
1	466	468	474	483
2	493	493	474	494
4	499	499	499	499
6	499	499	499	499
8	499	479	499	499
10	433	457	499	499
15	351	397	490	499
20	327	380	486	499
25	326	381	490	499
30	337	388	492	499
35	356	402	493	499
40	383	420	496	500
45	416	446	500	<b>5</b> 00

# REQUIRED ENS. HP AT MAX. STEER CONDITION

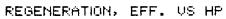


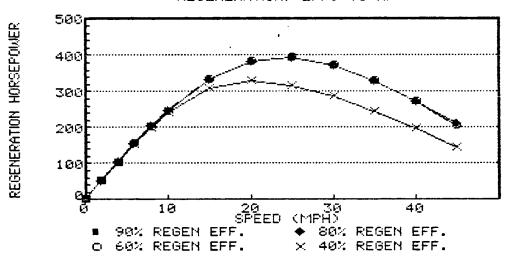
X Data	INNER SPKT @ 90%	OUTER SPKT @ 90%	INNER SPKT @ 40%	OUTER SF
1	4.73	63.27	0.21	57.42
2	9.15	126.15	-1.94	111.72
4	4.43	234.40	-17.86	204.68
6	-16.57	320.93	-48.30	276.71
8	-51.80	387.11	-91.06	327.51
10	-116.86	404.26	-140.81	357.07
15	-232.50	452.45	-229.44	403.59
20	-290.43	488.21	-254	416
25	-301.40	497.20	-235.33	405.57
30	-274.45	480.19	-194.63	383.54
35	-220.37	444.44	-140.86	354.32
40	-150.54	399.49	-78.98	321.35
45	-75.10	354.42	-7.91	282.79

### REGENERATION EFF. US SPROCKET HP



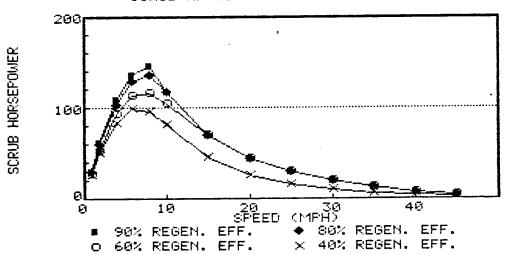
X Data	90% REGEN EFF.	80% REGEN EFF.	60% REGEN EFF.	40% REGEN EFF
0	0	Q.	0	0
2	52	52	52	52
4	104	104	103	103
6	155	155	154	152
8	204	204	202	199
10	248	248	246	240
15	334	334	334	310
20	383	<b>38</b> 3	383	331
25	394	394	394	317
30	373	373	373	286
3 <b>5</b>	329	329	329	245
40	272	272	272	197
45	212	212	205	143





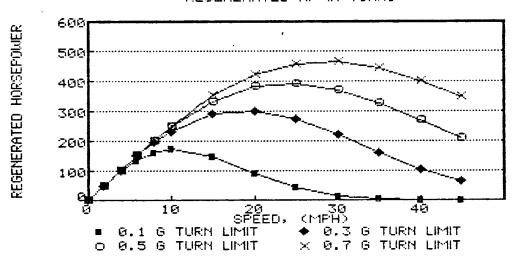
X Data	90% REGEN. EFF	. 80% REGEN. EFF.	60% REGEN. EFF.	40% REGEN. E
1	31	30	28	26
2	62	60	54	50
4	109	103	93	83
6	137	129	114	99
8	147	137	117	<b>9</b> 7
10	118	118	105	82
15	70	<b>7</b> 0	70	<b>4</b> 7
20	45	45	45	27
25	30	30	30	17
30	20	20	20	11
35	13	13	13	7
40	8	8	8	5
45	5	5	5	3





X Data	0.1 G TURN LIM	T 0.3 G TURN LIM	IT 0.5 G TURN L	IMIT 0.7 G TUR
0	o	0	0	0
2	52	52	<b>5</b> 2	52
4	101	104	104	104
6	139	154	155	155
8	164	197	204	204
10	175	234	248	252
15	152	293	334	353
20	95	304	383	423
25	44	275	394	460
30	16	222	373	466
35	5	162	329	445
40	1	108	272	403
45	Ō	66	212	349

### REGENERATED HP IN TURNS



B.4 Impact Of Grades On Motor Loads While Steering

Data for turns on grades was evaluated and found to produce high momentary loads that are within the thermal limits of the drive components. Two curve sets were produced to investigate alternate operational assumptions.

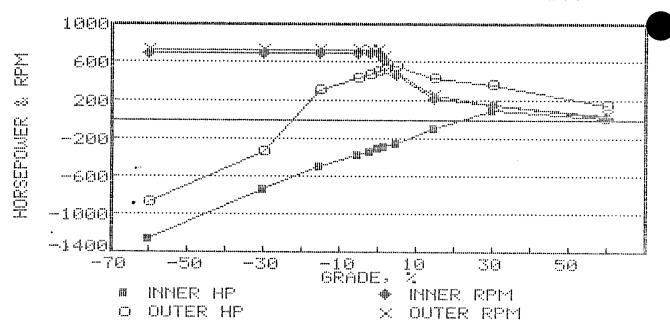
The first set (Figure B.4-1) are titled "Grade vs. Maximum Sprocket HP & RPM". These curves plot the speeds and loads for the highest horsepowers and RPM that are theoretically possible. The power inputs from the ground (indicated as horsepower) become very high under certain conditions. The implied operation that produced these results cover some areas that are unrealistic combinations of speed, grade and turn radius. It is considered unlikely that a driver will make the sharpest possible turn, at maximum speed on the steepest downgrade.

The second set of curves (Figure B.4-2) titled "Grade vs. Maximum Sprocket HP & RPM (LTD)" represent a more limited operational envelope. Downhill speeds are limited to the speeds that the vehicle can achieve on upgrades. These curves are considered representative of a prudent driver under normal operating conditions.

All points on the "LTD" curve are easily within the momentary overload capacity of the drives, which is considered reasonable for turning requirements. Downgrades steeper than 40% impose excessive loads at maximum 45 MPH speed, but operation at this combination of grade and speed is considered unrealistic. It was therefore concluded that normal turns on grades could present no peculiar load problems for the recommended electric drive systems.

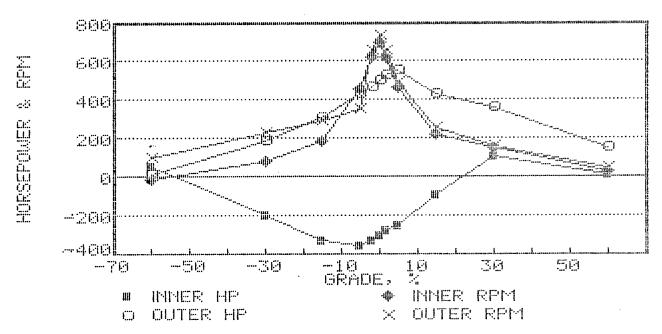
X Data	INNER HP	INNER RPM	OUTER HP	OUTER RPM
60	-1250.89	699.67	-877.63	733.17
-30	-731	699.67	-333.68	733.17
-15	-493.71	699.67	315.70	733.17
	-361.42	699.67	430.15	733.17
🚆	-325.45	699 <b>.</b> 67	469.25	733.17
O	-301.42	699.67	497.22	733,17
<u></u>	-277.40	617.97	525.18	<b>655.66</b>
5	-244.67	462.01	556.30	493.21
15	-93	223.28	430.98	254.34
30	111.69	154.84	361.74	163.57
<b>6</b> 0	16.49	32.89	148.84	46.71

### GRADE US MAXIMUM SPROCKET HP & RPM



X Data	INNER HE	INNER RPM	OUTER HE	OUTER RPM
-60	54.12	-17.08	13	96.68
-30	-195.50	83.83	184.11	234.58
-15	-323.88	188.55	312.41	289.06
-5	-348.27	452.49	430.15	356.10
-2	-325.45	617.97	469.25	<b>655.</b> 66
O	-301.42	699.67	497.22	733.17
2	-277.40	617.97	525.18	655.66
5	-244.67	462.01	556.30	493.21
15	ÇZ	223.28	430.98	254.34
30	111.69	154.84	361.74	163.57
<b>6</b> 0	16.49	32.89	148.84	46.71

GRADE US MAX SPROCKET HP & RPM (LTD.)



CODE: #2TRIEN

### SPROCKET HORSEPOWER

L.M. FERNANDEZ BY:W.E. RODLER

KEV. DATE: 91984

TREAD WIDTH,in= 92.5
TRACK LENGTH,in= 150
TRACK FITCH,in= 6.03
NUMBER OF SFROCKET TEETH= 11
ROLLING RESISTANCE,1b per ton= 100 REGENERATION EFF.= 90 KUN DATE:52985.11 GROSS VEHICLE WEIGHT, tons= 19.5 MAXIMUM VELOCITY ,mph= 45 ENGINE GROSS HP= 500 LOSS ENGINE HP= 60 FRONTAL AREA ,in= 57 COEFFICIENT OF DRAG= 1 DATA INFUT:

						B-1	102						
RESULTS:	SPEED (mph)	1.00	2.50	် (၁.၁	7.50	10.00	15.00	20.00	25.00	30.00	35.00	40.00	45.00
RESULTS:	SPEED ACCELERATION (mph) (gs)	0.01	0.09	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
N <u>ū</u>	RADIUS (ft)	4.77	4.44	ю М	7.54	13.40	30.15	53.60	83.75	120.60	164.15	214.40	271.35
¥	HORSEPOWER (hp)	16.68	. 54.12	226.28	-59.25	-257.74	-549.38	-762.19	-919.60	-1034.86	-1120.58	-1189.04	-1250.89
TOVOCOO GOMNI	ROT. SPEED (rpm)	-5.27	-17.08	-71.16	18.90	83.83	168.55	280.72	367.86	452.49	535.68	617.97	699.67
Ļ	ED TORQUE (16ft)	-16624.15	-16642.10	-16702.05	-16467.32	-16149.08	-15302.82	-14260.25	-13129.57	-12011.83	-10986.82	-10105.57	-9389.87
č	HORSEPOWER (hp)	4.86	13.00	33.72	22.53	10.07	-88.89	-110.18	-222.30	-364.63	-528.12	-702.31	-877.63
Fayonaa aatiw	ROT. SPEED (rpm)	37.11	96.68	230.36	219,91	234.58	289.06	356.10	428.16	502.74	578.75	- 655.66	733.17
	TORQUE (1bft)	687.73	706.35	768.70	537.98	225.35	-604.87	-1624.99	-2726.82	-3809.30	-4792.63	-5625.78	-6286.98

### SPROCKET HORSEPOWER BY:W.F. RODER

	* * * * * * * * * * * * * * * * * * * *	***** GUE (1bft)	70	P 9	រៀ	r5	00	78	99	82	្រ ព	98	m	n n	* * * * * * * * * * * * * * * * * * * *
	**************************************	******** ET TORQUE (1bf:	4581.70	4586.63	4598.55	4434.63	4122.00	3291.78	2271.66	1169.82	87.35	-895.98	-1729.13	-2390.33	****
91984 52985.10	**************************************	**************************************	36.90	93.16	190.83	219.91	234.58	289.06	356.10	428.16	502.74	578.75	655.66	733.17	******
REV.DATE: 91984 RUN DATE:52985.10	**************************************	**************************************	32.19	81.36	167.09	185.68	184.11	181,17	154.02	95.37	8.36	-98.73	-215.86	-333.68	*****
	****** TH= 11 per ton=	**************************************	-12724.82	-12729.08	-12738.60	-12570.67	-12252,43	-11406.18	-10363.61	-9232.92	-8115.18	-7090.17	-6208.92	-5493.22	**************************************
RODLER FERNANDEZ	**************************************	**************************************	-5.06	-13.56	-31.63	18.90	83.83	188.55	280.72	367.86	452.49	535.68	617.97	699.67	****
ВY:W.E. L.M.	******** TREAD WI TRACK LE TRACK PI NUMBER O ROLLING	**************************************	12.26	32.86	76.72	-45.23	-195.55	-409.49	-553,92	-646.68	-699.15	-723.15	-730.55	-731.79	*****
	**************************************		4.81	4.73	4.54	7.54	13.40	30.15	53.60	83.75	120.60	164.15	214.40	271.35	*******
KTRN	**************************************	**************************************	0.01	60.0	0.37	0.50	05.0	0.50	ೆ.	05.0	0.50	0.50	0.50	0.50	*****
CODE:#2TRTRN	SKAK***********************************	**************************************	1.00	2,50	5.00	7.50	10.00	15.00	20.00	25.00	30.00	35.00	40.00	45.00	***********
	* * * * * * *	**					B <b>-</b> 1	03		.*					*

CODE: #2TRTRN

REV. DATE: 91984 RUN DATE:52985.09

SPROCKET HORSEPOWER
BY:W.E. RODLER
L.M. FERNANDEZ

. = . 5 . = . 5	******** T TORQUE	(1bft)	6964.69	6961.25	6936.28	6819.26	6506.62	5676.41	4656.28	3554,45	2471.98	1488.65	655.49	-5.70	
E 28 29	**************************************	(rpm)	36.77	91.21	173.44	219.91	234.58	289.06	356.10	428.16	502.74	578.75	655.65	733.17	
GRADE,%=-15 COEFFICIENT OF FRIC MAXIMUM ACCELERATIC DRIVE EFF. @SR>.2= 100 REGENERATION EFF.=	**************************************	(hp)	48.76	120.90	229.06	285.53	290.62	312.41	315.70	289.77	236.62	164.04	81.83	-0.80	
11 ton=	**************************************	(1bft)	-10338.55	-10334.45	-10307.07	-10186.04	-9867.80	-9021.55	-7978.98	-6848.29	~5730.56	-4705.54	-3824.30	-3108.60	
TREAD WIDTH,in= 92.5 TRACK LENGTH,in= 150 TRACK FITCH,in= 6.03 NUMBER OF SPROCKET TEETH= ROLLING RESISTANCE,1b per	**************************************	(rpm)	-4.93	-11.61	-14.24	18.90	83.83	188.55	280.72	367.86	452.49	535.68	617.97	79.649	
TREAD WID TRACK LEN TRACK FII NUMBER OF ROLLING R	**************************************	(hp)	9.71	22.85	27.95	-36.65	-157.49	-323.88	-426.47	-479.66	-493.71	-479.93	-449.97	-414.12	
tons= 19.5 n= 45 1	**************************************	(ft)	4.84	4.91	5.38	7.54	13.40	30.15	53.60	83.75	120.60	164.15	214.40	271.35	
GROSS VEHICLE WEIGHT, ton MAXIMUM VELOCITY ,mph= 4 ENGINE GROSS HF= 500 LOSS ENGINE HF= 60 FRONTAL AREA ,in= 57 COEFFICIENT OF DRAG= 1	**************************************	(gs)	0.01	0.09	0.31	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	
GROSS VER MAXIMUM V ENGINE GR LOSS ENG) FRONTAL C	**************************************	(mph)	1.00	2.50	5.00	7.50	10.00	15.00	20.00	25.00	30.00	35.00	40.00	45.00	
	* * * * * * *						B-1	04			. ,	-			

CODE: #2TRTRN

### SPROCKET HORSEPOWER BY:W.E. RODLER

REV. DATE: 91984

		* -													
	** ** ** ** ** 50 ° = 50 ° .	******** F TORQUE (1bft)	8664.22	8654.59	8605.73	8507.33	8194.69	7364.48	6344.35	5242,52	4160.05	3176.72	2343.56	1682.37	
71984 52985.08	**************************************	**************************************	37.70	92.22	167.94	219.91	234.58	289.06	356.10	428.16	502.74	578.75	655.66	733.17	
REV.DAIE: 91984 RUN DATE:52985.08	**************************************	**************************************	62.19	151.97	275.18	356.21	366.01	405.32	430.15	427.38	398.21	350.06	292.57	234.85	
	**************************************	********* T TORGUE (1bft)	-8661.95	-8451.65	-8600.39	-8497.97	-8179.73	-7333.48	-6290.91	-5160.23	-4042.49	-3017.48	-2136.23	-1420.53	
RUDLEK FERNANDEZ	**************************************	**************************************	າ ເຄ ເກ	-12.62	-8.74	18.90	89. 89.	188.55	280.72	367.86	452.49	535.68	617.97	699.67	
BY:W.E. KUDLEK L.M. FERNAN	**************************************	**************************************	97.6	20.79	14.31	-30.58	-130.55	-263.28	-336.24	-361.42	-348.27	-307.76	-251.35	-189.24	
	**************************************	******** TURN RADIUS (ft)	4.64	4.82	5.72	7.54	13.40	30.15	53.60	83.75	120.60	164.15	214.40	271.35	
Z Z	**************************************	**************************************	0.01	0.09	0.29	0.50	0.50	ೆ.ಬೆಂ	0.50	0.50	0.50	0.50	0.50	0.50	
CODE:#ZIKIKN	**************************************	**************************************	1.00	2.50	5.00	7.50	10.00	15.00	20.00	25.00	30.00	35.00	40.00	45.00	
	* * * * * * *	* * * * *					E	3-10	)5						
	••	ara da esta esta esta esta esta esta esta est				. * .	**. *		*	•					

### HORSEFOWER SPROCKET

TRACK PITCH,in= 6.03 MAXIMUM ACCELERATION ,gs= .5 NUMBER OF SPROCKET TEETH= 11 DRIVE EFF. GSR>.2= 82 ROLLING RESISTANCE,1b per ton= 100 REGENERATION EFF.= 90 GRADE,%=-2 COEFFICIENT OF FRICTION= REV. DATE: 91984 RUN DATE:52985.07 TRACK LENGTH, in= 150 TREAD WIDTH,in= 92.5 BY:W.E. RODLER L.M. FERNANDEZ GROSS VEHICLE WEIGHT, tons= 19.5 MAXIMUM VELOCITY ,mph= 45 FRONTAL AREA ,in= 57 COEFFICIENT OF DRAG= 1 DATA INFUT. ENGINE GROSS HP= 500 LOSS ENGINE HF= 40 CODE: #2TRTRN

*	<u>, </u>	<i>.</i>	_	_		L.*		•	-	_	_	•	
*****	TORQUE (16ft)	9177.52	9154.86	9101.48	9018.33	8708.33	7878.11	6857,99	5756.16	4673.69	3690.36	2857.20	2196.01
*****	OUTER SPROCKET R ROT. SPEED (rpm)	37.67	89.74	163.22	219.27	234.58	289.06	356.10	428.16	502.74	578.75	655.66	733.17
**************************************	OL HORSEPOWER (hp)	65.82	156.42	282.85	376.51	388.95	433.59	464.98	469,25	447.37	406.66	356.69	306.55
********	(ET ED TORQUE (16ft)	-8147.97	-8124.66	-8068.87	-7981.70	-7666.09	-6819.84	-5777.27	-4646.59	-3528.85	-2503.84	-1622.59	-906.89
******	INNER SPROCKET R ROT. SPEED (rpm)	ທ. ອີ	-10.14	-4.02	19.53	83.83	188.55	280.72	367.86	452.49	235.68	617.97	699.67
********	IN HORSEPOWER (hp)	9.04	15.68	6.17	-29.69	-122.35	-244.84	-308.79	-325.45	~304.02	-255.37	-190.92	-120.81
******	TURN RADIUS (ft)	4.64	5.06	6.04	7.59	13.40	30.15	53.60	83.75	120.60	164.15	214.40	271.35
**********	YESULISE VEHICLE LATERAL SPEED ACCELERATION (mph) (gs)	0.01	0.08	0.28	0.50	0.50	0.50	0.50	ೆ.	0.50	0.50	0.50	0.50
******	TESCLOSE VEHICLE LATER( SPEED ACCELER( (mph) (gs)	1.00	2.50	00.00	7.50	10.00	15.00	20.00	25.00	30.00	35.00	40.00	45.00
****							B-:	106					

SPROCKET HORSEPOWER BY:W.E. RODLER

L.M. FERNANDEZ

REV. DATE: 91984 RUN DATE:52985.06

TRACK PITCH,in= 6.03 MAXIMUM ACCELERATION ,gs= .5 NUMBER OF SPROCKET TEETH= 11 DRIVE EFF. @SR>.2= 82 ROLLING RESISTANCE,1b per ton= 100 REGENERATION EFF.= 90 COEFFICIENT OF FRICTION= GRADE, %= 0 TRACK LENGTH, in= 150 TREAD WIDTH, in= 92.5 GROSS VEHICLE WEIGHT, tons= 19.5 MAXIMUM VELOCITY ,mph= 45 ENGINE GROSS HP= 500 LOSS ENGINE HP= 40 FRONTAL AREA ,in= 57 COEFFICIENT OF DRAG= 1 DATA INFUT: CODE: #2TRIEN

	TORQUE (16ft)	9499.67	9489.80	9432.63	9341.42	9051.36	8221.14	7201.02	6099.18	5016.71	4033.38	3200.23	2539.03	
TEX SPROCKET	ROT. SPEED (rpm)	36.05	88.34	160.35	214.70	234.58	289.06	356.10	428.16	502.74	578.75	655.66	733.17	
	HORSEPOWER (hp)	65.20	159.62	287.99	381.86	404.27	452.46	488.24	497.22	480.21	444.45	399.51	354.44	
1_	TORQUE (1bft)	-7784.08	-7773.54	-7713.93	-7618.74	-7323.07	-6476.82	-5434,25	-4303.56	-3185.82	-2160.81	-1279.56	-563.86	
THAUCAGS SENNI	ROT. SPEED (rpm)	-4.21	-8.74	-1.15	24.11	83.88	188,55	280.72	367.86	452.49	535.68	617.97	699.67	
1	HORSEFOWER (hp)	6.23	12.94	1.69	-34.97	-116.88	-232.52	-290.45	-301.42	-274.47	-220.39	-150.56	-75.12	
Nation	RADIUS (ft)	5.02	5.20	6.25	7.95	13.40	30.15	53.60	83.75	120.60	164.15	214.40	271.35	
1 STEED!	SPEED ACCELERATION (gs)	0.01	0.08	0.27	0.47	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	
RESULTS:	SPEED AC (mph)	1.00	2.50	5.00	7.50	10.00	15.00	20.00	25.00	30.00	35.00	40.00	45.00	

CODE: #2TRTRN

### SP-ROCKET HORSEPOWER BY:W.E. RODLER L.M. FERNANDEZ

REV.DATE: 91984 RUN DATE:52985.04

******	00 = .7 .9s= .5	*****	TORQUE (1bft)	9819.20	9809.54	9742.01	9637.65	9394.38	8564.16	7544.04	6442.21	5359.74	4376.41	3543.25
********	NO 82	*****	OUTER SPROCKET R ROT. SPEED (rpm)	34.48	84.72	153.18	205.41	234.58	289.06	356.10	428.16	502.74	578.75	655,66
*********		*****	OU) HORSEPOWER (hp)	64.47	158.24	284.13	376,93	419.60	471.34	511.49	525.18	513.04	482.25	442.33
**************************************	EETH= 11 o per ton= 100	**************************************	r TORQUE (1bft)	-7417.55	-7407.22	-7337.28	-7228.92	-6980.04	-6133.79	-5091.22	-3960.54	-2842.80	-1817.79	-936.54
********	TREAD WIDTH,in= 92.5 TRACK LENGTH,in= 150 TRACK PITCH,in= 6.03 NUMBER OF SPROCKET TEETH= ROLLING RESISTANCE,1b per	*****	INNER SPROCKET R ROT. SPEED (rpm)	-2.64	-5.12	. 6.03	33.39	83.83	188,55	280,72	367.86	452.49	535, 68	617.97
*****	TREAD WIDTH,in= TRACK LENGTH,in= TRACK FITCH,in= NUMBER OF SPROCK ROLLING RESISTAN	****	IORSEFOWER (hp)	3.73	7.22	-8.42	-45.96	-111.40	-220.21	-272.12	-277.40	-244.92	-185.40	-110.19
******	BHT, tons= 19.5 imph= 45 500 0 57 57	****	TURN RADIUS (ft)	5.44	5.62	6.86	8.81	13.40	30.15	53.60	83.75	120.60	164.15	214.40
·*************************************		*******	ESULTS: EHICLE LATERAL SPEED ACCELERATION (mph). (gs)	0.01	0.07	0.24	0.43	0.50	0.50	0.50	0.50	0.50	0.50	0.50
******* 0+0	GROSS VEHICLE WED MAXIMUM VELOCITY ENGINE GROSS HP= LOSS ENGINE HF= 6 FRONTAL AREA ,in=	******	RESCULTS: VEHICLE LATER( SPEED ACCELER( (mph). (gs)	1.00	2.50	00.00	7.50	10.00	15.00	20.00	25.00	30.00	35.00	40.00
****		****						В	-10	3				

CODE: #21RTRN

### SPROCKET HORSEPOWER BY:W.E. RODLER L.M. FERNANDEZ

REV. DATE: 91984 RUN DATE:52985.03

*	* 0									
** ** 7. =80.	********* T TORQUE (lbft)	10319.70	10303.44	10231.41	10110.77	9897.54	9077.80	8057.68	6842.79	4322.86
**************************************	**************************************	33.71	82.05	148.74	198.69	233.49	289.06	356.10	426.58	493.21
**************************************	**************************************	1 45.24	160.96	289.75	382.50	440.02	499.61	546.32	556.30	405,95
**************************************	**************************************	-6890.78	-6873.85	-6799.41	-6674.76	-6456.02	-5620.15	-4577.59	-3333.84	-778.65
**************************************	**************************************	-1.87	-2,45	10.47	40.12	84.92	188.55	280.72	369.04	462.01
********* TREAD WID TRACK LEN TRACK PIT NUMBER OF	**************************************	2.45	3.20	-13.55	-50.98	-104.38	-201.77	-244.67	-234.25	-68.50
**************************************		5.68	5,98	7.30	9.55	13.50	30.15	53.60	87.16	194.25
**************************************	**************************************	0.01	0.07	0.23	62.0	0.49	0.50	0.50	0.48	0.31
DATA INF. WE BROSS VEHICLE WEI MAXIMUM VELOCITY ENGINE GROSS HP= LOSS ENGINE HP= 6 FRONTAL AKEA, in= COEFFICIENT OF DR	**************************************	1.00	2.50	S.00	7.50	10.00	15.00	20.00	25.00	30.00
* * * * *	* * * *							B <b>-</b> 1	09	
*	*						::	12.5		ŧ.

## SPROCKET HORSEPOWER

CODE:#2TRTRN L.M. FERNANDEZ RUN DATE: 91984  ***********************************	
T.M. FERNANDEZ  ***********************************	REV.DATE: 91984
**************************************	RUN DATE:52985.01
DATA INFUT:	***************
TORAN MINING ON R	
בענים מיתוני ליוים	.5 GRADE, %= 15
MAXIMUM VELOCITY ,mph= 45 TRACK LENGTH,in= 150	50 COEFFICIENT OF FRICTION= .7
TRACK FITCH,in= 6.03	03 MAXIMUM ACCELERATION ,qs= .5
LOSS ENGINE HF= 60 NUMBER OF SPROCKET TEETH= 11	
,	ROLLING RESISTANCE,1b per ton= 100 REGENERATION EFF.= 90
CUETTICIENI UF DRAG= 1	

VEHICLE LATERAL	LATERAL	TURN	Z	INNER SPROCKET	<b></b>	.00	<b>OUTER SPROCKET</b>	_
SPEED AC	SPEED ACCELERATION	RADIUS	HORSEPOWER ROT. SPEED	ROT. SPEED	TORQUE	HORSEPOWER	HORSEPOWER ROT. SPEED	TOROUE
( 4dm)	(56)	(ft)	(hp)	(rpm)	(1bft)	(hp)	(rpm)	(1bft)
1.00	0.01	5.47	10.30	0.31	-5158.84	71.83	d1.53	11963.90
2.50	90.0	7.27	-4.94	5.08	-5114.34	169.14	74.52	11920.07
5.00	0.18	6.35	-24.38	25.61	-4999.53	300.33	100.00	11807.67
7.50	92.	13.37	-57.12	62.72	-4782,95	388,74	176.08	11595.10
10.00.	0.29	22,75	86.26-	114.80	-4299.46	430.98	203.61	11117.22
15.00	0.15	97.57	-57.01	223,28	-1341.11	395.87	254.34	8174.90

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REV.DATE: 91984 RUN DATE:52985.02	**************************************
SPROCKET HORSEPOWER BY:W.E. RODLER L.M. FERNANDEZ	TREAD WIDTH,in= 92.5  TREAD WIDTH,in= 92.5  TRACK LENGTH,in= 150  TRACK PITCH,in= 6.03  NUMBER OF SPROCKET TEETH= 11  ROLLING RESISTANCE,1b per ton= 100 REGENERATION EFF.= 90
CODE:#2TRTKN	**************************************
· ·	***

***	*******	************		**************************************	*******	*********	********	*****	******
٠.	RESU	RESULTS:	į	į			Ö	1. 20 00 00 00 1. 1.	ŀ
	VEHICLE SPEED	VEHICLE LATERAL SPEED ACCELERATION	TURN RADIUS	IN HORSEPOWER	INNEK SFRUCKE! HORSEPOWER ROT. SPEED	ı TORQUE	OO HORSEPOWER	ODIEK SPRUCKEI HORSEPOWER ROT. SPEED	TORQUE
	(mph)	(36)	(ft)	(hp)	(rpm)	(1bft)	(hp)	(rpm)	(1bft)
	1.00	0.01	9.23	-2.49	4.98	-2623.10	72.61	26.86	14197.42
	2.50	0.04	10.34	-7.51	15.38	-2562.79	172.87	64.22	14137.78
	္ ် ရ	0.11	15.38	-20.43	46.77	-2294.58	296.97	112.44	13871.97
	7.50	0.12	30.10	-28.00	94.24	-1560.50	361.74	144.57	13141.90
	10.00	0.03	231.58	111.69	154.84	3788.48	242.87	163.57	7798.54

### SFROCKET

CODE: #2TRIRN

HORSEPOWER
BY:W.E. RODLER
L.M. FERNANDEZ

TREAD WIDTH,in= 92.5
TRACK LENGTH,in= 150
COEFFICIENT OF FRICTION= .7
TRACK PITCH,in= 6.03
NUMBER OF SPROCKET TEETH= 11
DRIVE EFF. @SR>.2= 82
ROLLING RESISTANCE,1b per ton= 100 REGENERATION EFF.= 90 REV.DATE: 91984 KUN DATE:52985.05 DATA INFUT: GROSS VEHICLE WEIGHT, tons= 19.5 MAXIMUM VELOCITY ,mph= 45 ENGINE GROSS HP= 500 LOSS ENGINE HP= 60 FRONTAL AREA ,in= 57 COEFFICIENT OF DRAG= 1

*****		TORQUE	(lbft)	17476.94	16735.96
****	<b>OUTER SPROCKET</b>	HORSEPOWER ROT. SPEED TORQUE	(rpm)	20.72	46.71
********	TUO	HORSEPOWER	(hp)	68.94	148.84
*****		TORQUE	(1bft)	1890.67	2632.33
******	INNER SPROCKET	ROT. SPEED	(rpm)	11.12	32.89
**************************************	Z	HORSEPOWER ROT. SPEED	(hp)	4.00	16.49
*****	TURN	RADIUS	(ft)	21.05	36.55
***	VEHICLE LATERAL	SPEED ACCELERATION	(36)	00.00	0.01
##************************************	VEHICLE	SPEED /	(Aqm)	1.00	2.50
***					

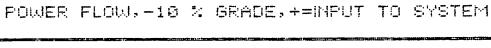
### B.5 Downhill Steering Limit

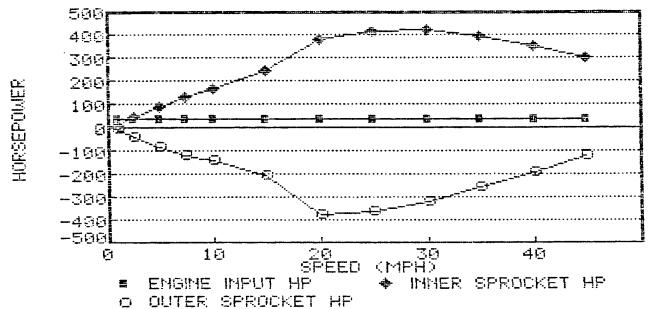
Limited available power while coasting downhill can limit steering control. When operating on moderate downgrades, the engine can at times be operating near idle condition. Steering reactions can then be limited by power available. This condition is encountered with mechanically driven tracked vehicles and it is necessary for the drive to give the engine added throttle to obtain normal steering response. Since it is instinctive to turn and apply brakes to avoid an obstacle, special driver training is required to assure proper response. The results of the studies on this subject are shown on the following curves and their data sheets.

- 1. Figure B.5-1: These curves show a typical power distribution for maximum turn going down a moderate grade.
- 2. Figure B.5-2: These curves replot the same data as Figure B.5-1, but a summation curve "Engine + Both Sprockets" is shown. At points near 20 MPH the net power barely covers system losses.
- 3. Figure B.5-3: These curves show that below 20 MPH decreased net engine power degrades steering ability.
- 4. Figure B.5-4 and B.5-5: These curves plot the same data with different scales for better legibility. They show that steering ability is limited up to 25 MPH.

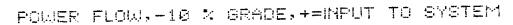
Acceleration analysis was made for the 60% grade starts and the results are shown in Figures 5.2.6.4-1. These curves show positive starts that promptly reach grade limited speed.

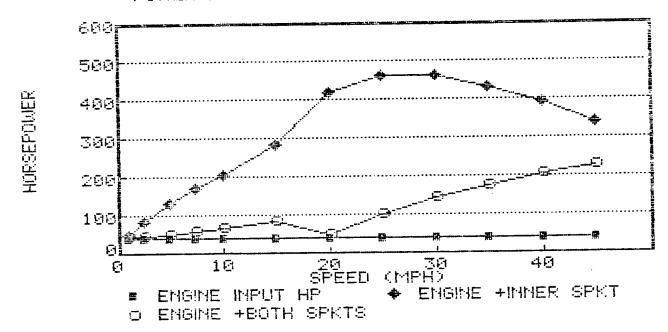
X Data	ENGINE INPUT	HP INNER SPROCKET H	POUTER SPROCKET HP
• · · · · · · · · · · · · · · · · · · ·	40	9.94	-5.29
2.50	40	46.46	-42.85
5	40	92	-83.80
7.50	40	132.80	-116.02
10	40	167.29	-138.97
15	40	245.55	-201.24
20	40	381.67	-372.48
25	40	420.95	-355.04
30	4 Q	421.51	-316.79
35	40	394.47	-256.34
40	40	351.38	-185.40
45	40	302.50	-116.14





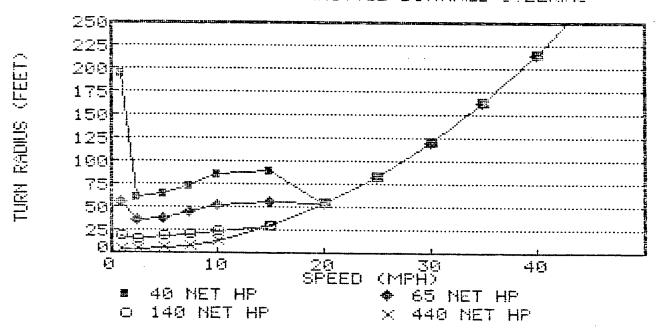
ENGINE INFUL F	IF ENGINE TINNER SER	I ENGINE TECHNOCKIO
40	9.94	-5.29
40	46.46	-42.85
40	92	-83.80
	132.80	-116.02
	167.29	-138.97
	245.55	-201.24
40	381.67	-372.48
40	420.95	-358.04
	421.51	-316.79
	394.47	-254.34
	351.38	-186.40
40	302 <b>.5</b> 0	-116.14
	40 40 40 40 40 40 40 40 40	40       46.46         40       92         40       132.80         40       167.29         40       245.55         40       381.67         40       420.95         40       421.51         40       394.47         40       351.38





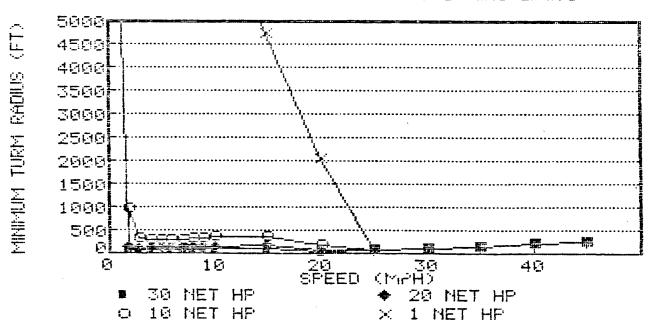
X Data	40 NET HE	65 NET HP	140 NET HE	440 NET HP
1	194.88	56.54	18.07	4.85
2.50	62.12	36.16	16.04	4.97
5	64.65	39.02	17.97	5.68
7.50	73.82	45.09	20.80	7.54
10	86.38	52.89	24.45	13.40
15	90.75	55.72	30.15	30.15
20	53.60	53.60	53.60	53.60
25	83.75	<b>8</b> 3.75	83.75	83.75
30	120.60	120.60	120.60	120.60
35	164.15	164.15	164.15	164.15
40	214.40	214.40	214.40	214.40
45	271.35	271.35	271.35	271.35

### LIMITED PART THROTTLE DOWNHILL STEERING



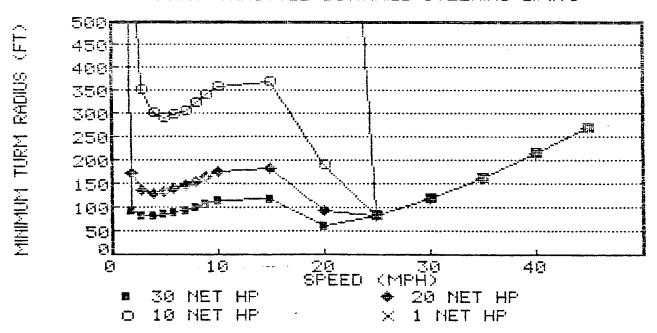
X Data	30 NET HP	20 NET HP	10 NET HP	1 NET HE
1	9108.08			
2	95.08	173.44	986.73	
3	84.55	136.40	352.76	
4	84.59	132.11	301.45	
5	87.33	134.50	292.54	
6	91.34	139.66	296.52	
7	96.28	146.57	304.84	19534.49
8	102.11	155.01	321.68	9943.98
7	108.97	165.11	340.61	7847.88
10	115.67	175.01	359.44	6962.97
15	121.24	182.60	369.69	4746.54
20	63.59	95.49	191.67	2048.84
25	83.75	83.75	83.75	83.75
30	120.60	120.60	120.60	120.60
35	164.15	164.15	164.15	164.15
40	214.40	214.40	214.40	214.40
45	271.35	271.35	271.35	271.35

### PART THROTTLE DOWNHILL STEERING LIMITS



X Data	30 NET HP	20 NET HP	10 NET HF	1 NET HE
1	9108.08			
2	95.08	173.44	986.73	
<u></u>	84.55	136.40	352.76	
4	84.59	132.11	301.45	
5	87.33	134.50	292.54	
6	91.34	139.66	296.52	
7	94.28	146.57	304.86	19534.49
8	102.11	155.01	321.68	9943.98
9	108.97	165.11	340.61	7847.88
10	115.67	175.01	359.44	6962.97
15	121.24	182.60	369.69	4746.54
20	<b>63.5</b> 9	95.49	191.67	2048.84
25	83.75	83.75	83.75	83.75
30	120.60	120.60	120.60	120.60
35	164.15	164.15	164.15	164.15
40	214.40	214.40	214.40	214.40
45	271.35	271.35	271.35	271.35

### PART THROTTLE DOWNHILL STEERING LIMITS



CODE:#2TRIKN SPROCKET HORSEPOWER

BY;W.E. RODLER L.M. FERNANDEZ

REV.DATE: 91984 KUN DATE:60385.01 MAXIMUM ACCELERATION , 95= .5 COEFFICIENT OF FRICTION= ,7 DRIVE EFF. @SR>, 2= 82 REGENERATION EFF. # 90 GRADE, %=-10 ROLLING RESISTANCE, 16 per ton= 100 NUMBER OF SPROCKET TEETH= 11 TREAD WIDTH, in= 92.51999 TRACK LENGTH, in= 150 TRACK PITCH, in= 6.03 GROSS VEHICLE WEIGHT, tons= 19.5 MAXIMUM VELOCITY , mph= 45 COEFFICIENT OF DRAG= 1 DATA INPUT: ENGINE GROSS HP= 125 FRONTAL AREA ,in= 57 LOSS ENGINE HP= 60

KESULTS.	RESULTS:		**************************************	****	*********	*********	*********	****
VEHICLE	VEHICLE LATERAL	TURN	NI .	INNER SPROCKET			OUTER SPROCKET	
(mph)	HCCELENHIJUN (gs)	(ft)	nukseruwek (hp)	KUI. SPEED (rpm)	(lbft)	HUKSEPUWEK (hp)	KU!. SPEED (rpm)	lakade (16ft)
1.00	0.00	56.54	-18.97	14.13	-7047.65	18.03	17.71	5349.33
B-1	0.01	36.16	-49.47	32.82	-7918.06	55, 41	46.79	6220.42
119	0.04	39.20	98.82	66.72	-7779.53	107.14	92.49	6084.30
7.50	90.0	45.09	-146.89	102.60	-7519.33	151.14	136.21	5828,10
10.00	0.13	52.89	-191.77	140.11	-7188.98	186.83	178.30	5503.36
15.00	0.27	55.72	-284.71	211.61	-7066.44	273.33	266.00	5396.85
20.00	0.50	53.60	-381.67	280.72	-7140.83	372.48	356.10	5493.69
25.00	0.50	83.75	-420.95	367.86	-6010,21	358.04	428.16	4391.93
30.00	0.50	120.60	-421.51	452.48	-4892.54	316.79	502.74	3309.52
35.00	0.50	164,15	-394.46	535.68	-3867.58	256.34	578.75	2326.25
40.00	0.50	214,40	-351.38	617.97	-2986.39	186.40	655.66	1493.14
45.00	0.50	271.35	-302.50	19.669	-2270.73	116.14	733.17	831.99

CODE:#2TRTRN		SPROCKET		HORSEPOWER W.E. KODLER L.M. FERNANDEZ	i e	REV. BATE: 91984 Run Date: 60385.02	91984 0385.02	
BATA GROSS VI HAXIMUM ENGINE ( LOSS ENI FRONTAL	######################################		TREAD WIDS TRACK LENE TRACK PITC NUMBER OF ROLLING RE	**************************************	999 ETH= 11	######################################	######################################	######################################
RESULTS: VEHICLE LATER( SPEED ACCELER( (aph) (95)	FESULTS: VEHICLE LATERAL TURN SPEED ACCELERATION KADIO (Aph) (95)	* * * 50	**************************************	**************************************	**************************************	**************************************	**************************************	******** TORQUE (1bft)
1.00	00.0	194.88	-9.94	15.40	-3389.41	5.29	16.44	60.1691
2.50	0.01	.62.12	-46.46	35.74	-6828.45	42.85	43.87	5130.81
B-1	0,03	64.65	-92.00	71.79	-6730.42	83.80	87.41	5035.19
20	0.05	73.82	-132.80	109.14	-6390,59	116.02	129.67	4699.36
10.00	B0.0	86.38	-167.29	147.51	-5956.53	138.97	170.90	4270.91
15.00	0.17	- 51.06	-245.55	- 222.11	-5806,35	201.24	255.50	4136.77
20.00	0.50	53.60	-381.67	280.72	-7140.83	372.48	356.10	5493.69
25.00	0.50	83.75	-420.95	367.86	-6010.21	358.04	428.16	4391.93
30.00	0.50	120.60	-421.51	452.48	-4892.54	316.79	502.74	3309.52
35.00	0.50	164.15	-394.47	535.48 -	-3867.59	256.34	578.75	2326.25
40.00	0.50	214.40	-351.38	- 79.719	-2986.39	186.40	655.66	1493.14
45.00	. 50	271.35 -	-302.50	- 19.64	-2270	116.14	733.17	831.99

CODE:#2TRTRN SPROCKET HORSEPOWER BY:W.E. KODLER

BY:W.E. RODLER L.M. FERNANDEZ

KEV.DATE: 91984 KUN DATE:60385.04

*	*********	中国中央中国中国中国中国中国中国中国中国中国中国中国中国中国中国中国中国中国中	**********	**********	*******	*********	· 一种,我们的一个,我们们的一个,我们的一个,我们的一个,我们的一个,我们们的一个,我们的一个,我们的一个,我们的一个,我们的一个,我们的一个,我们的一个,我们的一个,	*********	*******
	GROSS VEHICLE MAXIMUM VELOC ENGINE GROSS LOSS ENGINE H FRONTAL AREA	GROSS VEHICLE WEIGHT, tons= GROSS VEHICLE WEIGHT, tons= MAXIMUM VELOCITY , mph= 45 ENGINE GROSS HP= 90 LOSS ENGINE HP= 60 FRONTAL AREA , in= 57 COEFFICIENT OF DRAG= 1	f,tons= 19.5 ph= 45 7	TREAD WIDTERCK LENG TRACK PITC NUMBER OF ROLLING RE	TREAD WIDTH,in= 92.51999 TRACK LENGTH,in= 150 TRACK PITCH,in= 6.03 NUMBER OF SPROCKET TEETH= ROLLING RESISTANCE,ID por	11 ton=	GRADE, X=-10 COEFFICIENT OF FRIC MAXIMUM·ACCELERATIC DRIVE EFF. #SR>, 2= 100 KEGENERATION EFF.=	GRADE, X=-10 COEFFICIENT OF FRICTION= MAXIMUM ACCELERATION , 96 DRIVE EFF, 46R>, 2= 82 REGENERATION EFF, = 90	Z 55
*		李宗林 计多数 医多种 医多种 医多种 医多种 医多种 医多种 医多种 医多种 医多种 医多种	# # # # # #		********	**********	***************************************	*********	*******
	KESULIS VEHICLE LATE SPEED ACCELE (aph) (9s	L I S : Lateral Acceleration (95)	TURN RADIUS (ft)	INNER SPROCKET HORSEPOWER ROT, SPEED (hp) (rpm)	NER SPROCKE ROT, SPEED (rpm)	T TORQUE (1bft)	OUT Horsepower (hp)	OUTER SPROCKET R ROT, SPEED (rpm)	TORQUE (1bft)
·	1.00	0.00	9108.08	-2.57	15.91	-849.16	-2.58	15.93	-849.16
	2.50	0.00	87.14	-41.72	36.90	-5937.38	34.47	42.70	4239.74
	B-1	0.02	87.33	-83.35	73.82	-2930.15	68.85	85.39	4234.92
• • • •	21	0.04	99.08	-118.25	111.76	-5557.25	93.52	127.05	3866.02
· Ag	10.00	90.0	115.67	-145.44	150.47	-5076.39	108.42	167.94	3390.78
21.	15.00	0.12	121.24	-211.95	226.31	-4918.88	155.47	251.30	3249.30
	20.00	0.42	62.59	-368.21	286.63	-6746.88	340.02	350.18	5099.74
	25.00	0.50	83.75	-420.95	367.86	-6010.21	358.04	428.16	4391.93
	30.00	0.50	120.60	-421.51	452.48	-4892.54	316.79	502.74	3309.52
	35.00	0.50	164.15	-394.47	535.68	-3867,59	256.34	578.75	2326.25
٠	40.00	0.50	214.40	-351.38	617.97	-2986.39	186.40	655.66	1493.14
	45.00	0.50	271.35	-302.50	699.67	-2270.73	116.14	733.17	831.99

CODE:#2TRIRN

## SPROCKET HORSEPOWER BY:W.E. RODLER

BY:W.E. KODLER L.M. FERNANDEZ

REV. DATE: 91984 RUN DATE: 60385.05

DATA INPUT:	**************************************		******		*********	<b>李祁军等的 "我们的,我们的人们的人们的人们的人们的,我们们的人们的人们的人们的人们的人们的人们的人们的人们的人们的人们的人们的人们的人</b>	******	* * * * * * * * * * * * * * * * * * * *
GROSS VEHICLE WE MAXIMUM VELOCITY ENGINE GROSS HP= LOSS ENGINE HP= FRONTAL AREA , in	JICLE WEIGH VELOCITY , m ROSS HP= 20 INE HP= 60 AREA , in= 5 ENT OF DRAG	tons= 19,5 = 45	TREAD WIDT TRACK LENE TRACK PITC NUMBER OF ROLLING RE	TREAD WIDTH,in= 92.51999 TRACK LENGTH,in= 150 TRACK PITCH,in= 6.03 NUMBER OF SPROCKET TEETH= ROLLING RESISTANCE,1b per	11 ton=	GRADE, %=-10 COEFFICIENT OF FRICT MAXIMUM ACCELERATION DRIVE EFF. @SR>.2= 8'	L N 8 6	10N=.7 • 9s¤ • 5 2
中有多种的一种的一种,这种种种的一种的一种种种种种种种种种种种种种种种种种种种种种种种	******		*********	*********	*********	***************************************	*******	*****
VEHICLE LATERAL SPEED ACCELERAT (mph) (9s)	ESULIB: EHICLE LATERAL SPEED ACCELERATION (mph) (gs)	TURN RADIUS (ft)	INN Horsepower (hp)	INNER SPRÜCKET R ROT, SPEED (rpm)	r TORQUE (16ft)	OUTER SPROCKET HORSEPOWER ROT, SPEED (hp) (rpm)	rer sprocket Rot, speed (rpm)	TORQUE (16ft)
1.00	00.0	18.07	-17.29	10.33	-8793.15	29.06	21.51	7094.84
2.50	0.03	16.04	-40.76	24.06 -	-8897.13	76.13	55.54	7199.49
B-12	0.09	17.97	-86.26	51.50	-8796.37	145.62	107.70	7101.13
2	0.18	20.80	-136.68	82.98	-8650.86	206.49	155.83	6959.63
10.00	0.27	24.45	-190.04	117.89	-8466.32	258.87	200.51	6780.71
15.00	0.50	30.15	-293.78	188.55	-B183.34	358.50	289.06	6513.76
20.00	0.50	53.60	-381.67	280.72	-7140.83	372.48	356.10	5493.69
25.00	0.50	83.75	-420.95	367.86	-6010.21	358.04	428.16	4391.93
30.00	0.50	120.60	-421.51	452.48	-4892.54	316.79	502,74	3309.52
35.00	0.50	164.15	-394,47	535,68 -	-3867.59	256.34	578.75	2326.25
40.00	0.50	214.40	-351.38	617.97	-2986.39	186.40	655.66	1493.14
45.00	05.0	271.35	-302.50	- 19.649	-2276	116.14	733.17	831.99

HORSEPOWER BY:W.E. KODLER L.M. FERNANDEZ SPROCKET CODE: #2TRTRN

REV. DATE: 91984 KUN DATE:60385.06

******		******	TORQUE (16ft)	7547.54	7562.02	7496.96	7409.74	7299,55	6513.76	5493.69	4391.93	3309.52	2326.25	1493.14	831.99
********	GRADE,%=-10 COEFFICIENT OF FRICTION= MAXIMUM ACCELERATION ,95= DRIVE EFF. @SK>.2= 82 REGENERATION EFF.= 90	*********	ER SPROCKET ROT, SPEED (rpm)	26.58	67.22	127.99	181.99	230.13	289.06	356.10	428.16	502.74	578.75	655.66	735.17
********		**********	OUTER SPROCKET HORSEPOWER ROT, SPEED (hp) (rpm)	38.20	96.78	182.69	256.75	319.84	358.50	372.48	358.04	316.79	256.34	186.40	116.14
<b>非不可以有关的 计分词 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克里克氏 医克克氏 医克</b>	1999 EETH= 11 b per ton= 100	***************************************	T TORQUE (1bft)	-9245.86	-9259.66	-9192.19	-9100.97	-8985.17	-8183.34	-7140.83	-6010.21	-4892.54	-3867.59	-2986.39	-2270.73
*********	TREAD WIDTH,in= 92.51999 TRACK LENGTH,in= 150 TRACK PITCH,in= 6.03 NUMBER OF SPROCKET TEETH= ROLLING RESISTANCE,ID Per	********	INNER SPROCKET R ROT. SPEED (rpm)	5.26	12.39	31.22	56.82	88.28	188.55	280.72	367.86	452.48	535.68	617.97	699.67
*******	TREAD WID TRACK LEN TRACK PIT NUMBER OF ROLLING F	********	IN HORSEPOWER (hp)	-9.25	-21.84	-54.63	-98.46	-151.03	-293.78	-381.67	-420.95	-421.51	-394.47	-351,38	-302.50
********	tons= 19.5 = 45	***	TURN RADIUS (ft)	9.47	9.21	10.44	12.11	14.24	30.15	53.60	83.75	120.60	164.15	214.40	271.35
*********	DATA INFUT:  GROSS VEHICLE WEIGHT, tons=  HAXIMUM VELOCITY , mph= 45  ENGINE GROSS HP= 300  LOSS ENGINE HP= 60  FRONTAL AREA , in= 57  COEFFICIENT OF DRAG= 1	**********	ESULTS: EHICLE LATERAL SPEED ACCELERATION (mph) (gs)	0.01	0.05	0.16	0.31	0.47	0.50	0.50	0.50	0.50	0.50	0.50	0.50
	DATA INFUT GROSS VEHICLE WEIGH MAXIMUM VELOCITY, ENGINE GROSS HP= 30 LOSS ENGINE HP= 60 FRONTAL AKEA, in= 3 COEFFICIENT OF DRAI	. 法审证年标准证书法证证法证证证证证证证证证证证证证证证证证证证证证证证证证证证证证证证证	RESULTS: VEHICLE LATER SPEED ACCELER (mph) (9s)	00.1	2.50	B-1	123	10.00	15.00	20.00	25.00	39.00	35.00	40.00	. 45.00
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CODE: #2TRIKN

### SPROCKET HORSEPOWER BYAMLE, RODLER

L.M. FERNANDEZ

KEV.DATE: 91984 KUN DATE:60385.07 MAXINUM ACCELERATION ,gs= .5 COEFFICIENT OF FRICTION= .7 DRIVE EFF. @SR>.2= 82 ROLLING RESISTANCE, 1b per ton= 100 REGENERATION EFF. = 90 GRADE, %=-10 NUMBER OF SPROCKET TEETH= 11 TREAD WIDTH, in= 92.51999 TRACK LENGTH, 10= 150 TRACK PITCH, in= 6.03 GROSS VEHICLE WEIGHT, tons= 19.5 MAXIMUM VELOCITY , mph= 45 FRONTAL AREA jin= 57 COEFFICIENT OF DRAG= DATA INFUT: ENGINE GROSS HP= 400 LOSS ENGINE HP= 60

91000A	(1bft)	7714.52	7712.57	7664.55	7601.92	7343.92	6513.76	5493.69	4391.93	3309.52	2326.25	1493.14	831.99
_	(rpm)	31.66 77	78.89 77	148.27 76	208.15 76	234.59 73	289.06 65	356.10 54	428.16 43	502.74 33	578.75 23	655.66	733.17
ÖUT	(hp)	46.50	115.85	216.38	301.27	328.02	358.50	372,48	358.04	316.79	256.34	186.40	116.14
THOUGHT	(1bft)	-9412.88	-9410.20	-9359.79	-9293.14	-9029.54	-8163.34	-7140.83	-6010.21	-4892.54	-3867.59	-2986.39	-2270
INNER SPROCKET P. POT. GOGEN	(rpm)	0.18	0.71	10.93	30.66	83.82	188.55	280.72	367.86 -	452.48	535.68	- 76.719	19.69
NNI NNI	(hp)	-0.33	-1.28	-19.48	-54.25	-144.10	-293.78	-381.67	-420.95	-421.51	-394.47	-351.38	-302.50
TURN	(ft)	6.42	6.46	7.35	B.54	13.40	30.15	53.60	83.75	120.60	164.15	214.40	271.35
E S U L T S : EHICLE LATERAL SPEED ACCELERATION	(56)	0.01	0.06	0.23	0.44	0.50	0.50	0.50	0.50	0.50	0.50	0.50	9.50
REBULTS: VEHICLE LATERAL SPEED ACCELERAT	(Aph)	00.1	2.50	B-13	24	10.00	15.00	20.00	25.00	30.00	35.00	40.00	45.00

CODE:#2TRIRN

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SPROCKET HORSEPOWER BY:W.E. RODLER L.M. FERNANDEZ

REV. DATE: 91984 RUN DATE: 60385.08

*	DATA INTEL			*****	******	*********	*************************************	*****	*****
	GROSS VEHICLE WEIG MAXIMUM VELOCITY, ENGINE GROSS HP= 5 LOSS ENGINE HP= 60 FRONTAL AREA, in= COEFFICIENT OF ORA		tons= 19.5 = 45 1	TREAD WIDT TRACK LENG TRACK PITC NUMBER OF ROLLING RE	TREAD WIDTH,in= 92.51999 TRACK LENGTH,in= 150 TRACK PITCH,in= 6.03 NUMBER OF SPROCKET TEETH= ROLLING RESISTANCE,Ib por	1999 EETH= 11 b per ton= 100		CTI DN 82 90	7, =NO 2, =80,
*			*	********	*********	**********	*************************************	*********	*****
•	VEHICLE L SPEED ACC	LATERAL ACCELERATION (9s)	TURN RADIUS (ft)	INNER SPROCKET HORGEPOWER ROT. SPEED (hp) (rpm)	NER SPROCKE ROT. SPEED (rpm)	r (ORGUE (16ft)	OU) HORSEPOWER (hp)	OUTER SPROCKET R ROT, SPEED (rpm)	TORQUE (1bft)
	1.00	0.01	4.85	8.84	-4.89	-9499.69	54.56	36.73	7801.38
	2.50	0.08	4.97	19.81	-10.96	-9492.64	134.41	90.56	7795.00
	5.00	0.29	5.48	16.84	-9.36	-9452.36	248.96	168.54	7757.12
	B-1	0.50	7.54	-33.62	18.89	-9347.76	320.59	219.92	7656.54
-	25	0.50	13.40	-144.10	83.82	-9029.54	328.02	234.59	7343.92
	15.00	0.50	30.15	-293.78	188,55	-8183.34	358.50	289.06	6513.76
	20.00	0.50	53.40	-381.67	280.72	-7140.83	372.48	356.10	5493.69
.*	25.00	0.50	83.75	-420.95	367.86	-6010.21	358.04	428.16	4391.93
٠	30.00	0.50	120.60	-421.51	452.48	-4892.54	316.79	502.74	3309.52
	35.00	0.50	164.15	-394.46	535.68	-3867.58	256,34	578.75	2326.25
	40.00	0.50	214.40	-351.38	617.97	-2986.39	186.40	455.46	1493.14
	45.00	0.50	271.35	-302,50	19.669	-2270.73	116.14	733.17	831.99

	KEV, DATE: 6/3/BS	KUN DATE: 60383.10	
SHEDGET HOMSENDER	DYIM.E. KUDLEK	L. H. FEENANDEZ	
	CODESTRUCTOR		

ENGINE 6 LUSS ENE FRONTAL CUEFFICI	FRANTED VELGETT , MPT - CENTRE GROSS HPT - 90 FECON AL AREA , in = 57 COEFFICIENT OF DRAGE 1	<b>;</b>	TRACK LEN TRACK PITO NUMBER OF KOLLING R	IRACK LENGTH,10% 150 TRACK PLICH,10% 6.03 NUMBAK OF SPROCKET TEETH# KOLLING NEBIBTANCE,15 per	11 ton=	COEFFICIENT MAXIMUM ALC DRIVE EFF. 100 REGENERATIO	COEFFICIENT OF FRICTION= MAXIMUM ACCELERATION ,95= DRIVE EFF, 46K>,2= 82 REGENERATION EFF,= 90	7 : # 3 fb
FRESTALL TEST VENTER TO SERVICE LATERS TO SPEED ACCELLY (mph)	FARTESLIL TIES E VEHICLE LATERAL SPEED ACCELLIATION (up) (up)	TUKN YOUTUS (FE)	(H) VI VI VI VI VI VI VI VI VI VI VI VI VI V	RAKABRARKAK INNEK SPRUCKET R KOT, SPEED (TIM)	**************************************	*************************************	**************************************	**************************************
45.00	05.0	271.35	-302.50	699.67	-2270.73	116.14	735.17	831.99
40.00	0.20	214.40	-351,38	617.47	-2986.39	186.40	655.66	1493.14
55.00	0 22 0	164.15	-394.47	535,68	-3867.59	48.488	570.75	2326.25
30.00	0.50	120.60	-421.51	452.4B	4892,54	316.79	502.74	3309.82
25,00	0,00	H3.75	-420.95	347,86	-6010,21	358.04	428.14	4391.93
20.00	0.42	63.59	-368.21	286.63	-6746,88	340.02	350,10	5099.74
15.00	0.12	121.24	-211.95	226.31	-4918.88	155.47	251.30	3249.30
10.00	90.0	115.67	-145.44	150.47	-5076.39	108.42	167.94	3390.70
7.00	0.0t	108.97	-135.26	134.94	-5264.50	103.25	151.63	3576.45
u. 00	0.04	102.11	-124.30	119.45	-5465.50	97.24	135.20	3775.27
7.00	0.03	96.20	-111.80	104,10	-5643.54	69.37	118.79	3951.39
6.00	0.03	91.34	-9B.15	911.00	-5799.63	79.86	102.16	4105,80
8,00	0.02	H7.33	-83.35	73.82	-8930,15	58.82	65.48	4234,92
4.00	0.01	64.59	-67.53	5H.91	-6021.08	56.37	60.46	4324.69
3.8	0.01	84.15	-50.66	44.18	-6023.07	42.24	51.35	4325.78
2.00	0.00	95.08	~32.16	29.72	-5603.72	25.78	33.97	3985, 79
1.00	0.00	9108.08	\n.u-	12.91	-647,16	-2.58	15.93	-849.15

	SPROCKET HOROGROMME	
#STETEN	BYIW.E. KODLER	R
	L.M. FERNANDEZ	로
中华 华州 电 金 字 岩 平 市 二	1. C C C C C C C C C C C C C C C C C C C	3 3 3 3 4 4 4 4 4 4

**在出来市场中的大学的一个人,是一个人,是一个人,是一个人,是一个人,是一个人,是一个人的人,也不是一个人的人,也不是一个人的人,也不是一个人的人,也不是一个人的人,也不是一个人的人的人,也不是一个人的人的人,也不是一个人的人的人,也不是一个人的人的人的人,也不是一个人的人,也不是一个人的人,也不是一个人的人,也不是一个人的人,也不是一个人的人,也不是一个人的人,也不是一个人的人,也不是一个人的人,也不是一个人的人,也不是一个人的人,也不是一个人的人,也不是一个人的人,也不是一个人的人,也不是一个人的人,也不是一个人的人,也不是一个人的人,也不是一个人的人,也不是一个人的人,也不是一个人的人,也不是一个人的人,也不是一个人的人,也不是一个人的人,也不是一个人的人,也不是一个人的人,也不是一个人的人,也不是一个人的人,也不是一个人的人,也不是一个人,也不是一个人,也不是一个人,也不是一个人,也不是一个人,也不是一个人,也不是一个人,也不是一个人,也不是一个人,也不是一个人,也不是一个人,也不是一个人,也不是一个人,也不是一个人,也不是一个人,也不是一个人,也不是一个人,也不是一个人,也不** TKEAD WIDTH,in= 92.51999

TRACK LENGTH,in= 150

TRACK FITCH,in= 6.03

TRACK FITCH,in= 6.03

NUMBER OF SPROCKET TEETH= 11

BRIVE EFF. GSR>.2= B2

KOLLING KESISTANCE,ib per ton= 100 REGENERATION EFF.= 90 EV. DATE: 6/3/05 UN DATE: 60365,11 GROBS VEHICLE WEIGHT, tons= 19.5 MAXINUM VELUCITY , mph= 45 ENGINE GROSS HP= 80 LOSS ENGINE HP= 60 FRONTAL AREA ,in= 57 COEFFICIENT OF DRAG= 1 TEDAZA CEGO - 非不知及由此不及此功之

19 20 20 20 20 20 20 20 20 20 20 20 20 20	· · · · · · · · · · · · · · · · · · ·	"本有有有有有有有有	本有一种,我们们们们们的,我们们们的,我们也是有一种,我们的一种,我们的一种,我们们们的,我们们们的一种,我们也不是有一种,我们们们的一个一个,我们们们的一个一个,我们们们的一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个	"本书本本本本本本本本	米米女子本山安全 不太年年	- 李本本本本本本本本本本	**********	******
VEHICLE SPEED (mph)	SPEED ACCELERATION (mph) (us)	TUKN RADIUB (4.L)	HOKSEPUWEK HOKSEPUWEK (HD)	INNEK BPRUCKET EK KOT, BPEED (rpm)	r Tokoue (16ft)	OUI HORSEPOWER (hp)	OUTLR SPROCKET R ROT, SPEED (rpm)	TORGUE (154t)
45.00	0.20	271.35	-302,50	697.67	-2270.73	116.14	735.17	U31.99
40.00	0.30	214.40	80.180 1801	617.97	-2906.39	186.40	99.559	1493.14
32.00	0.50	164.15	-394.47	222.68	-3867.59	256.34	578.75	2326.25
30.00	0.50	120.60	-421.51	452,48	-4892,54	316.79	502,74	3309.52
25.00	0.50	83.75	-420.95	367.86	-6010.21	358.04	428.16	4391.93
20.00	0.28	95.49	-319.51	297.25	-5645.37	258.50	339.56	3998.23
15,00	0.08	182.60	-157.31	230.51	-3564, 35	60.06	247.10	1914.77
10.00	0.04	175.01	-108.97	153.43	-3730,19	64.22	164.90	2044.57
9.00	0.03	165.11	-102.88	137,78	-3921.77	63.28	148, 79	2233.72
B. 00	o.03	155.01	-46.05	122,15	-4129.99	41.54	132.58	2439.76
7.00	0.02	146.57	-67.59	106.62	-4314.79	58.06	116.27	2622.63
6.00	0.02	139.66	-77,6/	91.16	-4473.73	52, 86	99.86	2779.91
3.00	0.01	134.50	-66.39	75.85	-4597.03	46.06	93.36	2901.80
4.00	Ú, Ú1	132,11	-6.8.74	60.62	-4655.B1	37,61	66.74	2959.42
3.00	0.00	136.40	34.47	43. 43.	-4552.39	27.17	49.90	2855.10
2.00	0,00	173.44	-21.99	30.68	5745.81	13.00	33.01	2067.88

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# CHACL HOROT LUXCON-

BY:W.E. RODLER L.M. FERNANDEZ

REV. DATE: 6/3/85 RUN DATE: 60385.13 MAXIMUM ACCELERATION , gs= .5 GRADE, X=-10 COEFFICIENT OF FRICTION= .7 DRIVE EFF. GSRV. 2= 82 REGENERATION EFF. # 90 NUMBER OF SPROCKET TEETH= 11 ROLLING RESISTANCE,16 per ton= 100 TREAD WIDTH, in= 92.51999 TRACK LENGTH, INT 150 TRACK FITCH, in= 6.03 GROSS VEHICLE WEIGHT, tons= 19.5 MAXIMUM VELOCITY , mph= 45 ENGINE GROSS HF= 61 COEFFICIENT OF DRAGE FRONTAL AREA ,in= 57 COSS ENGINE HP= 60 DILDO

	**************************************	***************************************		***************************************	**********	**********	**********	**********	*******
	VEHICLE LATERAL SPEED ACCELERAT (mph) (gs)	EHICLE LATERAL SPEED ACCELERATION (mph) (gs)	TUKN RADIUS (ft)	INN HOKSEPOWEK (hp)	INNEK SPROCKET R KOT. SPEED (rpm)	TORQUE (1bft)	OUTER SPROCKET HORSEPOWER ROT, SPEED (hp)	OUTER SPROCKET R ROT, SPEED (rpm)	TORQUE (16ft)
45	45.00	0.50	271.35	-302,50	- 29.649	-2270.73	116.14	733.17	831.99
40	40.00	0,50	214.40	-351,38	617.97	-2986.39	186.40	455.66	1493.14
99	35.00	0.50	164.15	-394,46		-3867.58	256.34	578.75	2326.25
00	30.00	0.50	120.60	-421,51	452.48	-4892.54	316.79	502.74	3309.52
B-1	ŏ	0.50	83.75	-420.95	367.86	-6010.21	358.04	428.16	4391.93
128	Q	0.01	2048.82	92.49.	317.42	-823.59	-50.08	319,39	-823.55
₩ <b>7</b>	15.00	00.00	4746.54	-37.91	238.49	-834.79	-38.01	239.13	-834.79
10	10.00	00.0	6962.97	-28.62	159.06	-842.81	-25.87	189.38	-842.81
6	9.00	00.00	7847.88	-23.01	143.17	-844.03	-23.04	143,40	-844.03

-845.12

127.44

-20.51

-845.12

127,28

-20.4B

9943.9B

00.0

B. 00

-846.0B

111.48

-17.96

-845.08

1111.41

-17.95

19534.49

00.0

7.00

### B.6 A-C Induction Motor Drive System Electrical States

A detailed analysis of the deprating states of all components was made to assure that all components were operating within normal rated limits. The results are given in the following tables:

- 1. 19.5 Ton, Configuration I
- 2. 19.5 Ton, Configuration II
- 3. 40.0 Ton, Configuration I
- 4. 40.0 Ton, Configuration II

The voltage, current and frequencies values have been given vs. vehicle speed to illustrate the operational characteristics. These tables confirmed that there were no peculiar operating points to cause failure of the components.

INDUCTION MOTOR CONFIGURATION 1, GVW= 19.5, ELECTRICAL STATE DATA

(DURING MAXIMUM TRACTIVE EFFORT CONDITION)

SPEED	ALTERNATOR						BRIDGES (EACH) MOTORS(EACH)					
МРН	EXCITER OUTPUT					INPUT INPUT			-			
	"E"	"I"	"E"	"I"	"F"	"E"	"I"		"E"	"I"	"F"	
1.5			515	410	250	510	205		82	1253	17	
3.0		-	A	524	350		262		120	1097	33	
4.5				524	500		262			924	1	
6.0			-	526	4		263		161	817	67	
7.5				528			264.		179	738	83	
9.0			į	530			265		195	681	100	
10.5		,		536		3.10	268	,	210	639	117	
12.0				A			. 4	7	74	600	133	
13.5								7	37	566	150	
15.0						,	-   -			539		
16.5									-	515	ı	
18.0										495	ī	
19.5										476		
21.0										458		
22.5						/			303	442	250	
24.0							- 1			426		
25.5			ļ				-			415		
27.0			i				-			404		
28.5										393		
30.0										383		
31.5						:				373		
33.0	•						•   ;	_	_	365		
34.5	,							3	76	357	384	
36.0						!				349		
37.5	ł									342		
39.0	į					•				<b>\$</b>	433	
0.5	4					. !	T i			329		
2.0						and the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of t			- }	322		
3.5		٠				•			1	ì		
5.0			515	₹	A	•	V	4	<b>۲</b>	216	483	

INDUCTION MOTOR CONFIGURATION / , GVW= 407, ELECTRICAL STATE DATA

(DURING MAXIMUM TRACTIVE EFFORT CONDITION)

SPEED	ALTERNATOR						IDGES	(EACH)	(EACH) MOTORS(EACH)			
MPH	EXCITER OUTPUT					IN	PUT		INPUT			
	"E"	"I"	"E"	"I"	"F"	"E"	"I"		"E"	"I"	"F"	
1.5			412	1148		•	574			1471		
3.0				1372			686		217	1266	27	
4.5				1364	500	7	682	_	_	1071		
6.0				1400	7		700			946		
7.5				1398			699		_	856		
9.0				1414	}	!	704			789		
10.5			412	1420	1	408	7/0		282	738	93	
12.0			616	942	<b>\</b>	612	471		409	692	10	
13.5			:				1			654		
15.0					- {		. !		•	622		
16.5				•	-		,			<i>5</i> 95		
18.0							i			571		
19.5				) ; ;	1		i.			549		
21.0				:	}	1	i			529		
22.5			616	942		61/2	471	3	556	510	20	
24.0			718		-	714	404		573	494	21	
25.5			ì	•		!		5	590	480	22	
27.0				•	-				608	466	24	
28.5						1			625	453	25	
30.0				•					642	441	26	
31.5			718	804		714	404	(	557	431	27	
33.0			820	708	}	816	354	- 6	573	421	293	
34.5	•		;	) :	1	Ì	ì			411		
36.0			<b>{</b>	•						403	_	
37.5										394		
39.0						1				386		
40.5			•	•						379	-	
42.0			:		1				762	372	37	
43.5			•		7	1	•		776	365	386	
45.0			820	708	500	816	3<4	•	791	358	40	

induction motor configuration  $\underline{\underline{II}}$ , gvw=  $\underline{\underline{19.5}}$ , electrical state data

	(DURI)	NG MAXI	MUM TRAC	TIVE EFFORT	CONDITI	ON)		
SPEED	ALTER	RNATOR		BRIDGE <b>X <del>(EACH)</del> MOTOR<b>X (EAC</b></b>				
MPH	EXCITER	0	UTPUT	INPUT		INPUT		
	"E" "I"	"E"	"I" "F	"E" "I"		"E"	"I"	"F"
1.5		169	1253 250	/66/253		162	1253	17
3.0	:	249	350	246	- 4	240	1092	. 33
4.5	•	291.	_			284	924	50
6.0		329	*	326		322	817	67
7.5		365		3.62			738	
9.0		397		394		390	681	100
10.5		427		424		420	639	117
12.0		455		452		448	600	133
13.5		481		478			566	
15.0		505		502		498	539	161
16.5		529		526		522	515	18
18.0		268		265	•	261	1030	20
19.5		290		287	-	283	950	21
21.0		3/1		308		304	882	23
22.5		333	į	330			824	
24.0		355		352	-	348	772	26
25.5		376		373		369	727	28
27.0		398		395		391	686	30
28.5		420		417		413	650	31
30.0		442		439		435	618	333
31.5		463		460		456	<i>5</i> 88	35
33.0		485		482		478	561	36
34.5	*	507		504		500	537	38
36.0		529		<b>5</b> 26	۷	522	5/5	40
37.5		<i>5</i> 50		547		543	494	41
39.0		<i>5</i> 72		569			475	
0.5		594		591		587	457	45
2.0		616		613		609	441	46
3.5		637		634		630	426	48
5.0		659	412 500	656412	. (	65Z.	412	50
				D 100				

INDUCTION MOTOR CONFIGURATION II, GVW= 10T, ELECTRICAL STATE DATA

(DURING MAXIMUM TRACTIVE EFFORT CONDITION)

SPEED		ALTER	NATOR			BRI	IDGES	MOI	ORS	
MPH	EXC	ITER	0	UTPUT	•	INF	PUT	INF	UT	
	"E"	"I"	"E"	"I"	"F"	"E"	"I" ·	"E"	"I"	"F"
1.5		·····	305	1471	250	302	1471:	298	1471	13
3.0		•	441		350	438		434	1266	27
4.5	•		517		500	514	ţ-	510	1671	40
6.0		•	599			596	:	592	946	53
7.5			661			658		=	856	
9.0		•	721	:		718			789	
10.5		•	フフフ	:		774			738	
12.0			416	-		413		409	1384	106
13.5			410			407		433	1308	,120
15.0		•	462	·		459		455	1240	133
16.5			483	;		480		476	1190	146
18.0		,	503			500			1142	
19.5			523			520			1098	
21.0		,	542			539			1058	
22.5			<u>563</u>	****		560		556	1050	20
24.0			600			<b>S77</b>			988	
25.5			597			594	•	590	960	227
27.0			615			612		608	932	24
28.5			632			629		625	906	25
30.0		•	649	•		646		642	882	. 26
31.5			564			661		657	862	27
33.0		(	670			667		673	847	29
34.5	•	•	696			693		689	822	300
36.0			710			707			806	
37.5		-	726			723		719	788	33
39.0		-	740	-		737		734	772	34
40.5			754			751		747	758	36
42.0			769			766		767	744	37
43.5			783	ę.		780		ファ	730	38
45.0		•	798	358	500	795	358	791	358	40

B.7 Homopolar Motor Drive System Electrical States

A detailed analysis of the operating states of all components was made to assure that they were operating within normal rated limits. The results are given in the following tables:

- 1. 19.5 Ton, Configuration I
- 2. 40.0 Ton, Configuration I

The voltage and current values have been given tabulated vs. vehicle speed to illustrate the operational characteristics. These tables confirmed that there were no peculiar operating points to cause failure of the components.

#### SIMULATION ZOISSIE ELECTRIC VEHICLE

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### DC HONOPOLAR MOTOR DRIVE SYSTEMY 19.5 TON

REVISION DATE: 04/05/85 RUN DATE: 08-22-1985

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FMC / NORTHERN ORDNANCE DIVISION MINNEAPOLIS, MINNESOTA USA

ELECTRICALLY DRIVEN, TRACKED VEHICLE PERFORMANCE IS SIMULATED BY THIS PROGRAM. DETAILED ASPECTS OF VEHICLE PERFORMANCE CAN BE INVESTIGATED USING THE FOUR RESIDENT SUB-PROGRAMS LISTED BELOW. THE SUB-PROGRAM IN USE IS IDENTIFIED WITH AN ASTERISK.

\* 1.) ELECTRIC DRIVE PERFORMANCE

STEADY STATE VEHICLE PERFORMANCE ANALYSIS WITH DETAILED EMPHASIS ON ELECTRIC POWER DRIVE PARAMETERS. ENERGY USAGE, HEAT REJECTION, AND FUEL IMPACT ARE AL CALCULATED.

2.) VEHICLE ACCELERATION PERFORMANCE

DYNAMIC VEHICLE PERFORMANCE ANALYSIS WHICH REALISTICALLY SIMULATES BROSS VEHICLE MISSION OVER ALL TERRAIN CONDITIONS. ACCELERATION, DECELERATION, BRAKING AND MISSION OVER ALL TERRAIN CONDITIONS. ACCELE CONSTANT VELOCITY CONDITIONS ARE CONSIDERED.

> ACCELERATION DYNAMICS ROUTINE ^ M

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DYNAMIC INCREMENTAL DETAILED ANALYSIS OF FULL POWER VEHICLE ACCELERATION DURING TURNING AND NON-TURNING MANEUVERS ON USER SELECTED GRADES AND SURFACES. INCREMENTAL PARAMETERS ARE GENERATED AND TABULATED.

> REDUCTION DYNAMICS ROUTINE **.**.

B-135

NALYSIS OF SPEED/TORQUE LOADING OF ALL VEHICLE POWER TRAIN REDUCTION FINAL SPROCKET DRIVES AND DIESEL ENGINE INTERFACE ARE INCLUDED IN DETAILED ANALYSIS ELEMENTS. ANALYSIS. VEHICLE DATA COURSE: DATA INPUT BY USER DATE COURSE

GROSS VEHICLE WEIGHT, tons= 19.5 FRONTAL AREA, sq.

57 TREAD WIDTH, in. = 92.5 COEFFICIENT OF DRAG=

COEFFICIENT OF FRICTION= .7

SURFACE: COMPACTED SOIL

FERFORMANCE LIMITS

MAX. COURSE VELOCITY, mph= 45

NUMBER OF SPROCKET TEETH= 11

MAX. LAT. ACCEL., g's= .5

TRACK PITCH, in. = 6.03

TRACK LENGTH, in. = 150

ROLLING RESISTANCE, 16. per ton= 100

45

MAXIMUM VELOCITY, mph=

2100 SPEED FOR MIN. FUEL, rpm= MAX. SPEED, rpm= 2960 MAX. FOWER, hp=

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GENERATOR EFF., %= MOTOR KM V/Krpm-A=

PEAK MOTOR EFF., %=

TYPE: HoPol P-6

ENGINE: VTA-903

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DLTL

GEN. KG, V/Krpm-A= .005

1.5 INLET/EXHAUST LOSSES, % Ghp=

AUXILIARY POWER hp= 6

COOLING LOSSES, % Ghp=

FUEL CAPACITY, gal.= 175

SCHEDULING: CONSTANT

	ELECTRIC DRIVE TYPE HOPO1 P-6		RANGE ESTIMATE (miles) 17.31		NET DRIVE EFFICIENCY (%) 29.46		FUEL ECONOMY (mpg) 0.10			WER 7	D POWER (Kw) 15.0
	ENGINE SCHEDULING,		AVG. FORWARD VELOCITY (mph) 2.50		TORQUE (ft-1b) 9686.34		FUEL REMAINING (gal.) 173.09		SPROCKET MOTOR	HORSEPOWER (hp) 75.67	FIEL
	SCHE			***	SPROCKET SPEED (rpm) 39.80	*	FUEL NSUMED gal.) 1.915		OUTER SPROCK	TORQUE (ft-1b) 599.16	CURRENT (amps) 135278.50
* * *	ENGINE  VTA-903	***	CUMMULATIVE TIME (sec) 272.73	ı	OUTER SPI  HORSEPOWER (hp) 73.40	***	FUEL CONSUMED (gal.) 1.915	***	הם י	SPEED (rpm) 663.35	VoltAGE (valts) 1.00
PARAMETERS 	VEHICLE	SE DATA	CUMMULATIVE DISTANCE (ft) 1000	MANCE DATA	TORQUE HORS (ft-1b) (9686.34 7	RGY DATA	FUEL CONSUMPTION (1b/hr) 199.18	VE DATA	MOTOR	 HORSEPOWER (hp) 75.67	FIELD POWER (Kw) 15.0
	MAX. LAT. ACCEL. (g's) 0.50	A COURSE	TIME (sec) 272.73	PERFORMANCE	SPROCKET SPEED (rpm)	/ ENERGY	ENGINE SPEED (rpm) 2600.00	C DRIVE	SPROCKET MOT	TORQUE HC (ft-1b) 599.16	CURRENT (amps) 135278.50
NOISSIW	MAX. VELOCITY (mph) 45.00	NOISSIM	GRADE RADIUS (%) (ft) 60 0	VEHICLE	INNER S  HORSEFOWER (hp)	ENGINE	SEGMENT ENERGY LOSS (btu) 67756.57	ELECTRIC	INNER	SPEED T (rpm) (663.35	VOLTAGE C (volts) (1.00 135
* * * *	SURFACE 	* * * *	DISTANCE GRA  (ft) (%) 1000 60	***	LATERAL ACCELERATION (g's)	***	CUMMULATIVE ENERGY USED (btu) 96056.88	* * * *		GENERATOR FOWER (Kw) 269.21	BUSS CURRENT (amps) 270557.00
			SEGMENT NO. (#)		TRACTIVE EFFORT (K-1bs)	20.22	SEGMENT ENEKGY (btu) 96056.88			GENERATOR SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 1.00
	COURSE  DATA INPUT BY USER		LAP NO. 6 (#)		FORWARD VELOCITY (mph)	6. N B-136	HORSEPOWER GENERATED (hp) 498.30				

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DATA INPUT BY USER COMPACTED SOIL	ED SOIL		2.4	(mph) 45.00	(g's) 0.50	19.5 TON	N VTA-903	1	CONSTANT	HoPol P-6
***	**	¥	ΣI	NOISSI	COURSE	SE DATA	* * * * *			
SEGMENT NO. DISTANCE (#) (ft) 2 1000	STANCE (ft) 1000	U	GRADE (%) 57.5	RADIUS (ft) O	TIME (sec) 227.27	CUMMULATIVE DISTANCE (ft) 2000	CUMMULATIVE TIME (sec) 500.00		AVG. FORWARD VELOCITY (mph) 2.73	RANGE ESTIMATE (miles) 20.69
***	* * *		VEHIC	ICLE	PERFORMANCE	l	DATA *	***		
				INNER SF	SPROCKET		OUTER SI	SPROCKET		HOTAG THE
TRACTIVE LATERAL EFFORT ACCELERATION (K-1bs) (g's) 21.39 0.000	.ATERAL ELERATION (g's) 0.000		HORSEFOI (hp) 85.5	RSEPOWER (hp) 85.59	SPEED (rpm) 47.76	TORQUE (ft-1b) 9411.56	HORSEFOWER (hp) 85.59	SPEED (rpm) 47.76	TORQUE (ft—1b) .9411.56	EFFICIENCY (%) 34.24
***	* * *			NG I NE	/ ENERGY	RGY DATA	****	<u>.</u>		
SEGMENT CUMMULATIVE ENERGY ENERGY USED (btu) (btu) BO310.51 176367.40	CUMMULATIVE CNERGY USED (btu) 76367.40		SE(ENERGE)	SEGMENT ENERGY LOSS (btu) 52813.05	ENGINE SPEED (rpm) 2600.00	FUEL CONSUMPTION (1b/hr) 199.97		FUEL CONSUMED (gal.) 1.602	FUEL REMAINING (gal.) 171.48	FUEL ECONOMY (mpg) 0.12
* * *	* * *			ELECTRIC	C DRIVE	VE DATA	* * * *	·		
				INNER	SPROCKET MOTOR	TOR .	ō	OUTER SPROC	SPROCKET MOTOR	
GENERATOR GENERATOR SPEED POWER (rpm) (Kw) 10400.00 270.24	:NERATOR POWER (Kw) 270.24		SPEED (rpm) 796.02	<b>-</b> ~	TORQUE H( (ft-1b) 582.16	HORSEPOWER (hp) 88.23	SPEED (rpm) 796.02	TORQUE (ft-1b) 582.16	HORSEFOWER (hp) 88.23	OWER ) 23
BUSS BUSS VOLTAGE CURRENT (volts) (amps) 1.19 226326.80	BUSS CURRENT (amps)		VOLTAGE (valts) 1.19		CURRENT (amps)	FIELD POWER (KW) 15.0	VOLTAGE (valts) 1.19	CURRENT (amps) 113163.40		FIELD POWER (Kw) 15.0

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	ELECTRIC DRIVE TYPE HOPOI P-G		RANGE ESTIMATE (miles) 31.05		NET DRIVE	EFFICIENCY (%) 46.25		FUEL ECONOMY (mpg) 0.18			4ER 5	OWER ()
	ENGINE SCHEDULING 		AVG. FORWARD VELOCITY (mph) 3.14			TORQUE (ft-1b) 8471.20		FUEL REMAINING (gal.) 170.42		SPROCKET MOTOR	HORSEPOWER (hp) 119.13	FIELD POWER (Kw) 15.0
	SCHE			***	SPROCKET	SPEED (rpm) 71.64	.1.	_ MED • 7 57			TORQUE (ft-1b) 523.99	CURRENT (amps) 75399.44
***	ENGINE 	***	CUMMULATIVE TIME (sec) 651.52	1	OUTER SPR	HORSEPOWER (hp) 115.55	****	FUEL CONSUMED (gal.) 1.067	東亭本市	OUTER	SPEED (rpm) 1194.03	VOLTAGE (volts) 1.79
PARAMETERS	VEHICLE  19.5 TON	SE DATA	CUMMULATIVE DISTANCE (ft)	ANCE DATA		TORQUE HOR (ft-1b) 8471.20 1	GY DATA	FUEL CONSUMPTION (1b/hr) 199.85	E DATA	DR	HORSEPOWER (hp) 119.13	FIELD POWER (Kw) 15.0
1	MAX. LAT ACCEL. (q's) 0.50	A COURSE	TIME (sec) 151.52	PERFORMANCE	SPROCKET	SPEED (rpm) 71.64	/ ENERGY	ENGINE SPEED (rpm) 2600.00	IC DRIVE	SPROCKET MOTOR	TORGUE HO (+t-1b) 523.99	CURRENT F (amps) 75399.44
Noissim	MAX. VELOCITY (mph) 45.00	MISSION	RADE RADIUS (%) (+t)	VEHICLE	INNER	HORSEPOWER (hp) 115.55	ENGINE	SEGMENT ENERGY LOSS (btu) 28764.16	ELECTRIC	INNER	SPEED (rpm) (1194.03	VDLTAGE ((volts) (1.79 75
* * *	SURFACE COMPACTED SOIL	***	DISTANCE GRADE (%) (%) (%) (%)	***		LATERAL ACCELERATION (g's) 0.000	****	CUMMULATIVE ENERGY USED (btu) 229881.60	***		GENERATOR POWER (Kw) 270.09	BUSS CURRENT (amps) 150798.90
			SEGMENT NO. (#)			TRACTIVE EFFORT (K-1bs)		SEGMENT ENERGY (btu) 53514.22			GENERATOR SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 1.79
	COURSE  DATA INPUT BY USER		LAP NG. (#)			FORWARD VELOCITY (mph)	-138	HORSEPOWER GENERATED (hp) 499.69			95	

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	ELECTRIC DRIVE TYPE HOPOI P-G		RANGE ESTIMATE (miles) 41.58		FOR	REFICIENCY (X)		FUEL ECONOMY (mpg) 0.24			۸E.R 1	OOWER.
	NE IL ING 		AVG. FORWARD VELOCITY (mph) 3.57			TORQUE (ft-1b) 7504.59		FUEL REMAINING (gal.) 169.62		SPROCKET MOTOR	HORSEPOWER (hp) 140.71	FIELD POWER (Kw)
	ENGI SCHEDU 			* * *	OCKET	SPEED (rpm) 95.52		- IED,		SR SPROCK	TORQUE (ft-1b) 464.20	CURRENT (amps) 56312.49
*	ENGINE  VTA-903	* * *	CUMMULATIVE TIME (sec) 765.15	ļ	OUTER SPROCKET	HORSEPOWER (hp) 136.49	* * *	FUEL CONSUMED, (gal.) 0.797	***	OUTER	SPEED (rpm) 1592.04	VOLTAGE (volts) 2.39
PARAMETERS	VEHICLE	SE DATA	CUMMULATIVE DISTANCE (ft) 4000	MANCE DATA		TORQUE HOR( (ft-1b) 7504.59 1:	RGY DATA	FUEL CONSUMPTION (1b/hr) 198.99	VE DATA	TOR	HORSEFOWER (hp) 140.71	FIELD POWER (Kw) 15.0
	MAX. LAT ACCEL. (g's) 0.50	A COURSE	TIME (sec) 113.64	PERFORMANCE	SPROCKET	SPEED (rpm) 95.52	/ ENERGY	ENGINE SPEED (rpm) 2600.00	C DRIVE	SPROCKET MOTOR	TORQUE HC (ft-1b) 464.20	CURRENT F (amps) 56312.49
NOISSIW	MAX. VELOCITY (mph) 45.00	MISSION	GRADE RADIUS (%) (ft) 42 0	VEHICLE F	INNERS	HORSEFOWER (hp) 136.49	ENGINE	SEGMENT ENERGY LOSS (btu) 18065.08	ELECTRIC	INNER	GPEED T (rpm) (1592.04	VOLTAGE C (valts) (2.39 56
* * *	SURFACE  COMPACTED SOIL	***	DISTANCE GR (+t) ( 1000 4	>   * * * *		LATERAL ACCELERATION (g's) 0.000	***	CUMMULATIVE ENERGY USED (btu) 269872,60	***		GENERATOR POWER (Kw) 268.96	BUSS CURRENT (amps) 112625.00
			SEGMENT NO. (#) 4			TRACTIVE EFFORT (K-1bs) 17.06		SEGMENT ENERGY (btu) 39991.02			GENERATOR SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 2.39
	COURSE  DATA INPUT BY USER		LAP NO. (#)	·		FORWARD VELOCITY (mph) 6.00	3-139	HORSEPOWER GENERATED (hp) 497.89			95 17	

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	ELECTRIC DRIVE TYPE HaPal P-6		RANBE ESTIMATE (miles) 51.98	•	NET DRIVE	EFFICIENCY (%) 60.03		FUEL ECONOMY (mpg) 0.30			MER 5	POWER SO
	ENGINE SCHEDULING  CONSTANT		AVG. FORWARD VELOCITY (mph) 3.98			TORQUE (ft-1b) .6573.10		FUEL REMAINING (gal.) 168.98		OUTER SPROCKET MOTOR	HORSEPOWER (hp) 154.06	FIELD POWER (Kw)
				***	SPROCKET	SPEED (rpm) 119.40	ı <b>i</b> .	3 \ 2 \ 3 \ 3 \ 3 \ 3 \ 3 \ 3 \ 3 \ 3 \		ER SPROCK	TORQUE (ft-1b) 406.58	CÜRRENT (amps) 45047,25
***	ENGINE 	* * *	CUMMULATIVE TIME (sec) 856.06	# # H H H	OUTER SPR	HORSEPOWER (hp) 149.44	* * * *	FUEL CONSUMED (gal.) 0.638	***	דטס	SPEED (rpm) 1990.05	VOLTAGE (volts) 2.99
PARAMETERS 	T. VEHICLE  19.5 TON	SE DATA	CUMMULATIVE DISTANCE (ft) 5000	1		TORQUE HOR (ft-1b) 6573.10 1	RGY DATA	FUEL CONSUMPTION (1b/hr) 198.97	VE DATA	ror	 HORSEPOWER (hp) 154.06	FIELD POWER (KW) 15.0
1	MAX. LAT. ACCEL. (g´s) 0.50	N COURSE	TIME (sec) 90.91	PERFORMANCE	SPROCKET	SPEED (rpm) 119.40	/ ENERGY	ENGINE SPEED (rpm) 2600.00	IC DRIVE	SPROCKET MOTOR	TORGUE H( (ft-1b)	CURRENT (amps) 45047.25
NISSIM	MAX. VELOCITY (mph) 45.00	MISSIM	RADE RADIUS (%) (ft) 35.3 0	VEHICLE	INNER	HORSEPOWER (hp) 149.44	ENGINE	SEGMENT ENEKGY LOSS (btu) 12786.72	ELECTRIC	INNER	SPEED (rpm) (1990.05	VOLTAGE C (volts) ( 2.99 45
* * *	SURFACE  COMPACTED SOIL	***	DISTANCE GRADE (ft) (%) (%) 1000 35.3	₩ ₩ ₩ ₩		LATERAL ACCELERATION (g's) 0.000	* * *	CUMMULATIVE ENERGY USED (btu) 301863.80	****		GENERATOR POWER (Kw) 268.94	BUSS CURRENT (amps) 90094.49
			SEGMENT NO. (#) 5			TRACTIVE EFFORT (K-1bs) 14,94		SEGMENT ENEKGY (btu) 31991.15			GENERATOR SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 2.99
	COURSE  DATA INPUT BY USER		LAP NO. S (#)			FORWARD VELOCITY (mph) 7.50	B-140	HORSEPOWER GENERATED (hp) 497.86			9E 10	

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	ELECTRIC DRIVE TYPE 		RANGE ESTIMATE (miles) 62.72		NET DRIVE	EFFICIENCY (%) 61.79		FUEL ECONOMY (mpg) 0.36			OWER ) 83	FIELD POWER (Kw) 15.0	**********
	ENGINE SCHEDULING  CONSTANT		AVG, FORWARD VELOCITY (mph) 4.39			TORQUE (ft-1b) 5611.78		FUEL REMAINING (gal.) 168.45		SPROCKET MOTOR	E HORSEPOWER 5) (hp) 12 157.83		*****
	SCH			***	SPROCKET	SPEED (rpm) 143.28		1ED 28		ER SPRO(	TORQUE (ft-1b) 347.12	CURRENT (amps) 37337.84	* * * * * *
* * * *	ENGINE  VTA-903	* * *	CUMMULATIVE TIME (sec) 931.82	1	OUTER SPRC	HORSEPOWER (hp) 153.10	* * *	FUEL CONSUMED (gal.) 0.528	* * *	OUTER	SPEED (rpm) 2388.04	VOLTAGE (volts) 3.58	*****
PARAMETERS 	VEHICLE  19.5 TON	SE DATA	CUMMULATIVE DISTANCE (ft) 6000	ANCE DATA		TORGUE HOR (ft-1b) 5611.78 1	GY DATA	FUEL CONSUMPTION (1b/hr) 197.87	VE DATA	OR	 HORSEFOWER (hp) 157.83	FIELD POWER (Kw) 15.0	***********
	MAX. LAT. ACCEL. (g's) 0.50	A COURSE	TIME (sec) 75.76	PERFORMANCE	SPROCKET	SPEED (rpm) 143.28	/ ENERGY	ENGINE SPEED (rpm) 2600.00	IC DRIVE	INNER SPROCKET MOTOR	TORQUE HC (+t-1b) 347.12	CURRENT F (amps) 37337,84	********
NOISSIM	MAX. VELOCITY (mph) 45.00	MOISSIM	RADE RADIUS (%) (+t) 28.8 0	VEHICLE	INNER	HORSEPOWER (hp) 153.10	ENGINE	SEGMENT ENERGY LOSS (btu) 10140.59	ELECTRIC	I INNER	SPEED (rpm) 2388.05	VOLTAGE (volts) 3.58	******
* * * *	SURFACE  COMPACTED SOIL	***	DISTANCE GRADE (%) (%) (%) 1000 28.8	***		LATERAL ACCELERATION (g's) 0.000	***	CUMMULATIVE ENERGY USED (btu) 328400.10	*****		GENERATOR POWER (Kw) 267,49	BUSS CURRENT (amps) 74675.68	**************************************
			SEGMENT NO. (#) 6			TRACTIVE EFFORT (K-1bs) 12.76		SEGMENT ENERGY (btu) 26536.36			GENERATOR SPEED (rpm) 10400.00	BUSS VOLTAGE (valts) 3.58	*****
	COURSE  DATA INPUT BY USER		LAP NO. S (#)	·		FORWARD VELOCITY (mph) 9.00	B-14	HORSEPOWER GENERATED (hp) 495.57					*******

	DRIVE TYPE		RANGE ESTIMATE (miles) 72.81		EVISO THE	EFFICIENCY (%) 62.29		FUEL ECONOMY (mpg) 0.42			WER 8	.D POWER (Κω) 15.0	(
	ENGINE SCHEDULING 		AVG. FORWARD VELOCITY (mph) 4.79			TORQUE (ft-1b) 4869.35		FUEL KEMAINING (gal.) 168.00		SPROCKET MOTOR	HORSEPOWER (hp) 159.78	FIEL	
	SCHE			* * * *	SPROCKET	SPEED (rpm) 167.16		1ED .			TORQUE (ft-1þ) 301.20	CURRENT (amps) 32158.75	
* * * *	ENGINE  VTA-903	* * *	CUMMULATIVE TIME (sec) 996.75	I	OUTER SPRO	HORSEPOWER (hp) 154.98	* * *	FUEL CONSUMED (gal.) O.455	***	OUTER	SPEED (rpm) 2785.07	VOLTAGE (volts) 4.18	
PARAMETERS	VEHICLE	SE DATA	CUMMULATIVE DISTANCE (ft) 7000	ANCE DATA		TORQUE HOR (ft-1b) 4869.35 1	ATAG YBS	FUEL CONSUMPTION (1b/hr) 198.86	JE DATA	OR	 HORSEFOWER (hp) 159.78	FIELD POWER (Kw) 15.0	
- 1	MAX. LAT ACCEL. (g's) 0.50	COURSE	TIME (sec) 64.94	PERFORMANCE	SPROCKET	SPEED (rpm) 167.16	/ ENERGY	ENGINE SPEED (rpm) 2600.00	C DRIVE	SPROCKET MOTOR	TORQUE HO (ft-1b) 301.20	CURRENT F (amps) 32158.75	
NOISSIM	MAX. VELOCITY (mph) 45.00	NOISSIM	GRADE RADIUS (%) (ft) 24 0	VEHICLE	INNER S	HORSEPOWER (hp) 154.98	ENGINE	SEGMENT ENERGY LOSS (btu) 8613.30	ELECTRIC	INNER	SPEED T (rpm) (2786.07	VOLTAGE C (volts) (	
* * * *	SURFACE  COMPACTED SOIL	* * *	DISTANCE GRA (ft) (% 1000 24	***		LATERAL ACCELERATION (g's) 0.000	***	CUMMULATIVE ENERGY USED (btu) 351240.10	***		GENERATOR FOWER (Kw) 268.79	BUSS CURRENT (amps) 64317.49	
			SEGMENT NO. (#) 7			TRACTIVE EFFORT (K-1bs)		SEGMENT ENERGY (btu) 22839.93			GENERATOR SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 4.18	
	COURSE  DATA INPUT BY USER		LAP NO. (#)	·		FORWARD VELOCITY (mph) 10.50	B-142	HORSEPOWER GENERATED (hp) 497.63			GE 17		

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	ELECTRIC DRIVE TYPE HaPol P-G		RANGE ESTIMATE (miles) 83.13		1	NEI DKIVE EFFICIENCY (%) 62.76		FUEL ECONOMY (mpg) 0.48			W WER	D POWER (Kw) 15.0
	ENGINE SCHEDULING 		AVG. FORWARD VELOCITY (mph) 5.18			TORQUE (ft-1b) 4296.88		FUEL REMAINING (gal.) 167.60		SPROCKET MOTOR	HORSEPOWER (hp) 161.13	FIEL
	SCHEI SCHEI			* * *	ICKET	SPEED (rpm) 191.04				ER SPROCKI	TORQUE (ft-1b) 265.79	CURRENT (amps) 28166.78
* * *	ENGINE	* * *	CUMMULATIVE TIME (sec) 1053.57	I	OUTER SPROCKET	HORSEPOWER (hp) 156.30	* * * *	FUEL CONSUMED (Qal.) O.399	市事本本	OUTER	SPEED (rpm) 3184.08	VOLTAGE (volts) 4.78
PARAMETERS	VEHICLE	SE DATA	CUMMULATIVE DISTANCE (ft) BOOO	AANCE DATA		TORQUE HOR: (ft-1b) 4296.88	3GY DATA	FUEL CONSUMPTION (1b/hr) 199.06	JE DATA	'ar	HORSEPOWER (hp) 161.13	FIELD POWER. (Kw) 15.0
ł	MAX. LAT ACCEL. (g's) 0.50	COURSE	TIME (sec) 56.82	PERFORMANCE	SPROCKET	SPEED (rpm) 191.04	/ ENERGY	ENGINE SPEED (rpm) 2600.00	C DRIVE	INNER SPROCKET MOTOR	TORQUE HC (+t-1b) 265.79	CURRENT (amps) 28166.78
NOISSIE	MAX. VELOCITY (mph) 45.00	NOISSIM	GRADE RADIUS (%) (+t) 20,4 0	VEHICLE P	INNER SP	HORSEFOWER (hp) 156.30	ENGINE	SEGMENT ENERGY LOSS (btu) 7447.89	ELECTRI	INNER S	SPEED TO (+ (rpm) (+ 3184.08	VOLTAGE CU (volts) (a 4.78 281
***	SURFACE 	* * * *	DISTANCE GR( (ft) (3	***		LATERAL ACCELERATION (g's) 0.000	***	CUMMULATIVE ENERGY USED (btu) 371242.00	****		GENERATOR POWER (KW) 269.06	FUSS CURRENT (amps) 56333.56
			SEGMENT ND. (#) 8			TRACTIVE EFFORT (K-1bs) 9.77		SEGMENT ENERGY (btu) 20001.95			GENERATOR SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 4.78
	COURSE  DATA INPUT BY USER		LAP NO. S (#)			FORWARD VELOCITY (mph) 12.00	B-143	HORSEPOWER GENERATED (hp) 498.05			GE 10	

	ELECTRIC DRIVE TYPE HOPOI P-G		RANGE ESTIMATE (miles) 93.62		NET DRIVE	65.22		FUEL ECONOMY (mpg) 0.53			JWER .6	D POWER (Κω) 15.0
	ENGINE SCHEDULING 		AVG. FORWARD VELOCITY (mph) 5.54			TORQUE (ft-1b) 3843.81		FUEL REMAINING (gal.) 167.24		OUTER SPROCKET MOTOR	HORSEPOWER ) (hp) 6 162.16	FIEL
	SCH			***	SPROCKĒT	SPEED (rpm) 214.93	<b>.</b>	it MED 5.)		ER SPROC	TORQUE (ft-1b) 237.76	CURRENT (amps) 25010.76
**	ENGINE	***	CUMMULATIVE TIME (sec) 1104.08	1	OUTER SPR	HORSEPOWER (hp) 157.30	***	FUEL CONSUMED (gal.) 0.354	**	TUO	SPEED (rpm) 3582.09	VOLTAGE (volts) 5.37
PARAMETERS 	VEHICLE 19.5 TON	SE DATA	CUMMULATIVE DISTANCE (ft) 9000	ANCE DATA		TORQUE HOR: (ft-1b) 3843.81 1	GY DATA	FUEL CONSUMPTION (1b/hr) 198.85	JE DATA	ÃO.	 HORSEFOWER (hp) 162.16	FIELD POWER (Kw) 15.0
1	MAX. LAT ACCEL. (g's) 0.50	COURSE	TIME (sec) 50.51	PERFORMANCE	SPROCKET	SPEED (rpm) 214.93	/ ENERGY	ENGINE SPEED (rpm) 2600.00	C DRIVE	SPROCKET MOTOR	TORQUE HO (ft-1b) 237.76	CURRENT F (amps)
MISSIM	MAX. VELOCITY (mph) 45.00	NOISSIM	KADE KADIUS (%) (ft) 17.6 0	ICLE	INNERS	HORSEFOWER (hp) 157.30	ENGINE	SEGMENT ENERGY LOSS (btu) 6533.06	ELECTRIC	INNER	SPEED T (rpm) (3582.09	VOLTAGE C (valts) ( 5.37 25
* * *	SURFACE 	***	DISTANCE GRADE (£1) (%) (%) 17.6	工山〇 ****		LATERAL ACCELERATION (g's) 0.000	***	GUMMULATIVE ENERGY USED (btu) 389005.40	***		GENERATOR POWER (Kw) 268.77	BUSS CURRENT (amps) 50021.52
	USER		SEGMENT NO. (#) 9			TRACTIVE EFFORT (K-1bs) 8.74		SEGMENT ENERGY (btu) 17763.41			GENERATOR SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 5.37
	COURSE  DATA INPUT BY		LAP NO. (#)	·		FORWARD VELOCITY (mph)	-144	HORSEPOWER GENERATED (hp) 497.60			9E	

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	ELECTRIC DRIVE TYPE 		RANGE ESTIMATE (miles) 104.05		NET DRIVE	EFFICIENCY (%) 63.69		FUEL ECONOMY (mpg) 0.59			Я	OWER O
	ENGINE SCHEDULING . ] CONSTANT		G. FORWARD VELOCITY (mph) 5.93			TORQUE (ft-1b) 3483,99		FUEL REMAINING (gal.) 166.93		ET MOTOR	HORSEPOWER (hp) 163.31	FIELD POWER (Kw) 15.0
	SCHEI		Α	***	SPROCKET	SPEED (rpm) 238.81				OUTER SPROCKET MOTOR	TORQUE (ft—1b) 215.50	CURRENT (amps) 22503.26
* *	ENGINE	***	CUMMULATIVE TIME (sec) 1149.53	I	OUTER SPRC	HORSEPOWER (hp) 158.41	* * *	FUEL CONSUMED (gal.) 0.319	****	OUTE	SPEED (rpm) 3980.10	VOLTAGE (valts) 5.97
PARAMETERS 	VEHICLE	SE DATA	CUMMULATIVE DISTANCE (ft) 10000	TANCE DATA		TORQUE HORS (ft-1b) 3483.99 15	GY DATA	FUEL CONSUMPTION (1b/hr) 198.79	ZE DATA	OR	HORSEPOWER (hp) 163.31	FIELD POWER (Kw) 15.0
	MAX. LAT. ACCEL. (g's) 0.50	COURSE	TIME (sec) 45.45	PERFORMANCE	SPROCKET	SPEED (rpm) 238.81	/ ENERGY	ENGINE SPEED (rpm) 2600.00	C DRIVE	INNER SPROCKET MOTOR	TORQUE HO (ft-1b) 215.50	CURRENT F (amps) 22503.26
NOISSIE	MAX. VELOCITY (mph) 45.00	MISSIM	GRADE RADIUS (%) (+t) (+t) 15.4 0	VEHICLE F	INNERS	HORSEPOWER (hp) 158.41	ENGINE	SEGMENT ENERGY LOSS (btu) 5804.08	ELECTRIC	INNER	SPEED T (rpm) (3980.10	VOLTAGE C (volts) (
* * *	SURFACE 	* * *	DISTANCE GF (ft) (ft) (	> * * *		LATERAL ACCELERATION (g's) 0.000	***	CUMMULATIVE ENERGY USED (btu) 404988.60	***		GENERATOR POWER (KW) 268.70	BUSS CURRENT (amps) 45006.52
			SEGMENT NO. (#) 10			TRACTIVE EFFORT (K-1bs) 7.92		SEGME JT ENERGY (btu) 15983.15			GENERATOR SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 5.97
	COURSE  DATA INPUT BY USER		LAP NG. S (#) 1			FORWARD VELOCITY (mph) 15.00	3-145	HORSEPOWER GENERATED (hp) 497.48				

	ELECTRIC DRIVE TYPE 		RANGE ESTIMATE (miles) 113.95		<u>.</u>	NEI DKIVE EFFICIENCY (%) 64.19		FUEL ECONOMY (mpg) 0.65			조ER 10	D POWER (Kw) 15.0	
	ENGINE SCHEDULING 		AVB. FORWARD VELOCITY (mph) 6.30			TORQUE (ft-1b) 3204.36		FUEL REMAINING (gal.) 166.64		SPROCKET MOTOR	HORSEPOWER ) (hp) 1 165.22	FIEL	
	SCH SCH			***	SPROCKET	SPEED (rpm) 262.69	,	1ED			TORQUE (ft-1b) 198.21	CURRENT (amps) 20546.45	
* * *	ENGINE	***	CUMMULATIVE TIME (sec) 1190.85	I	OUTER SPRC	HORSEPOWER (hp) 160.27	***	FUEL CONSUMED (gal.) 0.291	***	OUTER	SPEED (rpm) 4378.11	VOLTAGE (volts) 6.57	
PARAMETERS 	VEHICLE  19.5 TON	SE DATA	CUMMULATIVE DISTANCE (ft) 11000	ANCE DATA		TORQUE HOR( (ft-1b) 3204.36 1	GY DATA	FUEL CONSUMPTION (15/hr) 199.68	E DATA	<b>ж</b>	 HORSEPOWER (hp) 165,22	FIELD FOWER (Kw) 15.0	
	MAX. LAT ACCEL. (g's) 0.50	COURSE	TIME (sec) 41.32	FERFORMANCE	CKET	SPEED (rpm) 262.69	ENERGY	ENGINE SPEED (rpm) 2600.00	DRIVE	SPROCKET MOTOR	[ 		,
NO1881	;; 00 00		RADIUS (ft) o	1	INNER SPROCKET		\       	:NT LOSS ()	ELECTRIC	INNER SPR	TORQUE (ft-1b) 198.21	CURRENT (amps) 20546.45	
Σ ! Σ !	MAX. VELOCITY (mph) 45.00	MISSIM	GRADE RA (%) (*) 13.7 O	VEHICLE	ZH	 HORSEPOWER (hp) 160.27		SEGMENT ENERGY LOSS (btu) 5222.31		н	SPEED (rpm) 4378.11	VOLTAGE (volts) 6.57	
***	SURFACE  COMPACTED SOIL	***	DISTANCE GR( (ft) (7 1000 13	***		LATERAL ACCELERATION (g's) 0.000	***	CUMMULATIVE ENEKGY USED (btu) 419573.00	***		GENERATOR POWER (Kw) 269.86	BUSS CURRENT (amps) 41092.89	
			SEGMENT NO. (#) 11			TRACTIVE EFFORT (K-1bs) 7.28		SEGMENT ENERGY (btu) 14584.39			GENERATOR SPEED (rpm) 10400.00	BUSS · VOLTAGE (volts) 6.57	
	COURSE  DATA INPUT BY USER		LAP ND. (#)			FORWARD VELOCITY (mph)  U 16.50	-146	HORSEPOWER GENERATED (hp) 499.34				·	

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	ELECTRIC DRIVE TYPE 		RANGE ESTIMATE (miles) 124.40		. i	NEI DRIVE EFFICIENCY (%) 64.65		FUEL ECONOMY (mpg)				ď
	ELEC DRIVE		as as		į					<u>c</u> !	HORSEPOWER (hp) 166.31	FIELD POWER (Kw) 15.0
	ENGINE SCHEDULING 		AVG. FORWARD VELOCITY (mph) 6.66			TORQUE (ft-1b) .2956.65		FUEL REMAINING (gal.) 166.37		SKET MOTOR	~ <b>0</b> -	
	!			* * *	SPROCKET	SPEED (rpm) 286.57	*	FUEL DNSUMED (gal.) 0.266		OUTER SPROCKET	TORQUE (ft-1b) 182.89	CURRENT (amps) 18821.11
*	ENGINE	* * *	CUMMULATIVE TIME (sec) 1228.73	1	OUTER SP	 HORSEPOWER (hp) 161.32	* * * * * *	FUEL CONSUMED (gal.) 0.266	* * *	ם	SPEED (rpm) 4776.12	VOLTAGE (volts) 7.16
FARAMETERS	VEHICLE 19.5 TON	E DATA	CUMMULATIVE DISTANCE (ft) 12000	ANCE DATA		TORQUE HOR( (ft-1b) 2956.65 10	SY DATA	FUEL CONSUMPTION (16/hr) 199.54	E DATA	: بــ	HORSEPOWER (hp) 166.31	FIELD POWER (Kw) 15.0
1	MAX. LAT. ACCEL. (g's) 0.50	I COURSE	TIME (sec) 37.88	PERFORMANCE	SPROCKET	SPEED TC (rpm) (4	/ ENERGY	ENGINE SPEED (rpm) 2600.00	C DRIVE	SPROCKET MOTOR	TORQUE HORS (ft-1b) ( 182.89 16	CURRENT FIE (amps) 18821.11
NOISSIW	MAX. VELOCITY (mph) 45.00	MISSION	)E RADIUS (ft) 2 0	ICLE	INNER S	HORSEPOWER (hp) 161.32	ENGINE	SEGMENT ENERGY LOSS (btu) 4722.66	ELECTRIC	INNER	SPEED T (rpm) (4776.12	VOLTAGE CI (volts) ( 7.16 18
***	SURFACE 	***	DISTANCE GRADE (ft) (%) 1000 12.2	工山 > * * * *		LATERAL ACCELERATION (g's) 0.000	***	CUMMULATIVE ENERGY USED (btu) 432934.00	***		beneralor Power (Kw) 269.68	BUSS CURRENT (amps) 37642.21
			SEGMENT NO. (#) 12			TRACTIVE EFFORT (K-1bs) 6.72		SEGMENT ENERGY (btu) 13361.01			GENERATOR SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 7.16
	COURSE  DATA INPUT BY USER		LAP NO. S (#)			FORWARD VELOCITY (mph) 18.00	-147	HORSEPOWER GENERATED (hp) 499.04		•		,

	ELECTRIC DRIVE TYPE 		RANGE ESTIMATE (miles) 135.03		HOTAU	EFFICIENCY (%) 64.65		FUEL ECONOMY (mpg) O.77			IWER 14	D POWER (Kw) 15.0
	ENGINE SCHEDULING CONSTANT		AVG. FORWARD VELOCITY (mph) 7.02			TORGUE (ft-1b) 2724.73		FUEL REMAINING (gal.) 166.12		SPROCKET MOTOR	HORSEPOWER (hp) (4 166.04	FIEL
	В В В В В В В В В В В В В В В В В В В			***	SPROCKET	SPEED (rpm) 310.45	*	FUEL NSUMED gal.) 0.245		OUTER SPROC	TORQUE (ft-1b) 168.54	CURRENT (amps) 17340.28
* *	ENGINE	* * * *	CUMMULATIVE TIME (sec) 1263.70	1	OUTER SPF	HORSEFOWER (hp) 161.06	**	00		.n <sub>o</sub>	SPEED (rpm) 5174.13	VOLTAGE (volts) 7.76
PARAMETERS 	VEHICLE	SE DATA	CUMMULATIVE DISTANCE (ft) 13000	MANCE DATA		TORQUE HOR( (ft-1b) 2724.73 10	RGY DATA	FUEL. CONSUMPTION (1b/hr) 199.15	VE DATA	MOTOR	HORSEFOWER (hp) 166.04	FIELD POWER (Kw) 15.0
1	MAX. LAT ACCEL. (g's) 0.50	4 COURSE	TIME (sec) 34.97	PERFORMANCE 	SPROCKET	SPEED (rpm) 310.45	/ ENERGY	ENGINE SPEED (rpm) 2600.00	C DRIVE	SPROCKET MO	TORQUE H( (ft-1b) 168.54	CURRENT (amps)
MISSION	MAX. VELOCITY (mph) 45.00	MISSION	E RADIUS (ft)	VEHICLE	INNER S	HORSEFOWER (hp) 161.06	ENGINE	SEGMENT ENERGY LOSS (btu) 4352.32	ELECTRIC	INNER	SPEED 1 (rpm) (	VOLTAGE C (volts) (7.76 17
***	SURFACE  COMPACTED SOIL	* * *	DISTANCE GRADE (%) (%) (%) 10.8	****		LATERAL ACCELERATION (g's) 0.000	****	CUMMULATIVE ENERGY USED (btu) 445247.10	***		GENERATOR POWER (Kw) 269.16	FUSS CURRENT (amps) 34680.55
			SEGMENT NO. (#) 13			TRACTIVE EFFORT (K-1bs) 6.19		SEGMENT ENEKGY (btu) 12313.09			GENERATOR SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 7.76
	COURSE  DATA INPUT BY USER		LAP NO. S (#)			FORWARD VELGCITY (mph)  G 19.50	148	HORSEPOWER GENERATED (hp) 498.22			GE 10	

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	ELECTRIC 'DRIVE TYPE 		RANGE ESTIMATE (miles) 145.26		AUT AC TON	EFFICIENCY (%) 64.66		FUEL ECONOMY (mpg) 0.83			WER 1	D POWER (Kw) 15.0
	ENGINE SCHEDULING 		AVG. FORWARD VELOCITY (mph) 7.37			TORQUE (ft-1b) 2532.67		FUEL REMAINING (gal.) 165.90		ET MOTOR	HORSEPOWER (hp) 166.21	FIEL
	SCHED			*	CKET	SPEED (rpm) 334.33				OUTER SPROCKET MOTOR	TORQUE (ft-1b) 156.66	CURRENT (amps) 16117.99
* * *	ENGINE	***	CUMMULATIVE TIME (sec) 1296.16	****	OUTER SPROCKET	HORSEPOWER (hp) 161.22	* * *	FUEL CONSUMED (gal.) 0.228	* * *	BLOO	SPEED (rpm) 5572.14	VOLTAGE (valts) 8.36
PARAMETERS	VEHICLE	E DATA	CUMMULATIVE DISTANCE (ft) 14000	ANCE DATA		TORQUE HOR( (+t-1b) 2532.67 1	GY DATA	FUEL CONSUMPTION (1b/hr) 199.35	E DATA	JŘ.	HORSEPOWER (hp) 166.21	FIELD POWER (Kw) 15.0
- 1	MAX. LAT. ACCEL. (g's) 0.50	COURSE	TIME (sec) 32.47	PERFORMANCE	SPROCKET	SPEED 1	/ ENERGY	ENGINE SPEED (rpm) 2600.00	C DRIVE	SPROCKET MOTOR	TORQUE HOF (ft-lb) 156.66	CURRENT F: (amps) 16117.99
NOISSIM	MAX. VELOCITY (mph) 45.00	NOISSIM	GRADE RADIUS (%) (ft) 9.640001 0	VEHICLE	INNER SI	HORSEPOWER (hp) 161.22	ENGINE	SEGMENT ENERGY LOSS (btu) 4043.90	ELECTRIC	INNER	SPEED T (rpm) (5572.14	VOLTAGE C (valts) ( 8.36 16
* * *	SURFACE  C.MPACTED SOIL	***	DISTANCE GI (ft) 1000	***		LATERAL ACCELERATION (g's) 0.000	***	CUMMULATIVE ENERGY USED (btu) 456690.60	***		GENERATOR POWER (KW) 269.44	BUSS CURRENT (amps) 32235.98
			SEGMENT NO. (#) 14			TRACTIVE EFFORT (K-1bs) 5.76		SEGMENT ENERGY (btu) 11443.52			GENERATOR SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 8.36
	COURSE  DATA INPUT BY USER		LAP NG. (#)			FORWARD VELOCITY (mph) 21.00	B-14	O HORSEPOWER GENERATED (hp) 498.65			<b>⊕</b> ∓	

	ELECTRIC DRIVE TYPE HAPOl P-G		RANGE ESTIMATE (miles) 155.86		NET DRIVE	EFFICIENCY (%) 64.65		FUEL ECONOMY (mpg) 0.89			WER 8	D POWER (Kw) 15.0
	ENGINE SCHEDULING 		AVG. FORWARD VELOCITY (mph) 7.71			TORQUE (ft-1b) 2360.61		FUEL REMAINING (gal.) 165.68		SPROCKET MOTOR	HORSEPOWER (hp) 165.98	F IEL
	SCHE			* * *	SPROCKET	SPEED (rpm) 358.21		a ⊃ Er			TORQUE (ft-1b) 146.02	CURRENT (amps) 15023.01
* * *	ENGINE	***	CUMMULATIVE TIME (sec) 1326.47		OUTER SPRO	HORSEPOWER (hp) 161.00	* * *	FUEL CONSUMED (gal.) 0.213	***	OUTER	SPEED (rpm) 5970.15	VOLTAGE (volts) 8.96
PARAMETERS 	VEHICLE	SE DATA	CUMMULATIVE DISTANCE (ft) 15000	AANCE DATA	•	TORQUE HOR (ft-1b) 2360.61 1	RBY DATA	FUEL CONSUMPTION (1b/hr) 199.07	JE DATA	OR	 HORSEFOWER (hp) 165.98	FIELD POWER (Kw) 15.0
- 1	MAX. LAT ACCEL. (g's) 0.50	A COURSE	TIME (sec) 30.30	PERFORMANCE	SPROCKET	SPEED (rpm) 358.21	/ ENERGY	ENGINE SPEED (rpm) 2600.00	C DRIVE	SPROCKET MOTOR	TORQUE HC (ft-1b) 146.02	CURRENT (amps)
NOISSIM	MAX. VELOCITY (mph) 45.00	MISSIM	GRADE RADIUS (%) (ft) B.600001 0	VEHICLE	INNER	HORSEPOWER (hp) 161.00	ENGINE	SEGMENT ENERGY LOSS (btu) 3771.22	ELECTRIC	INNER	SPEED T (rpm) (5970.15	VOL.TAGE C (valts) (8.96 15
* * * *	SURFACE COMPACTED SOIL	***	DISTANCE G (ft) 1000	***		LATERAL ACCELERATION (g's) 0.000	* * *	CUMMULATIVE ENERGY USED (btu) 467358.80	***		GENERATOR POWER (KW) 269.07	BUSS CURRENT (amps) 30046.01
			SEGMENT NO. (#) 15			TRACTIVE EFFORT (K-1bs) 5.37		SEGMENT ENERGY (btu)			GENERATOR SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 8.96
	COURSE  DATA INPUT BY USER		LAP NO. (#)			FORWARD VELOCITY (mph) 22.50	3 <b>-</b> 150	HORSEPOWER GENERATED (hp) 498.07			<u> </u>	

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	ELECTRIC DRIVE TYPE HOPO1 P-G		RANGE ESTIMATE (miles) 165.79		-	NET DRIVE EFFICIENCY (%) 64.67		FUEL ECONOMY (mpg) 0.95			<b>н</b>	OWER ) o
	ENGINE SCHEDULING CONSTANT		AVG. FORWARD VELOCITY (mph) 8.06			TORQUE (ft-1b) 2218.99		FUEL REMAINING (gal.) 165.48		SPROCKET MOTOR	HORSEPOWER (hp) 166.42	FIELD FOWER (Kw)
	SCH			*	CKET	SPEED (rpm) 382.09		ΩΞΩ			TORQUE (ft-1b) 137.26	CURRENT (amps) 14121.70
* * *	ENGINE  VTA-903	* * *	CUMMULATIVE TIME (sec) 1354.88	* * * * T-	OUTER SPROCKET	HORSEPOWER (hp)	* * * *	FUEL CONSUMED (gal.) 0.200	***	OUTER	SPEED (rpm) 6368.16	VOLTAGE (volts) 9.55
PARAMETERS	VEHICLE	SE DATA	CUMMULATIVE DISTANCE (ft) 16000	MANCE DATA		TORQUE HOR (ft-1b) 2218.99 1	RGY DATA	FUEL CONSUMPTION (16/hr) 199.62	VE DATA	OR	 HORSEFOWER (hp) 166.42	FIELD FOWER (Kw) 15.0
	MAX. LAT. ACCEL. (g's) 0.50	COURSE	TIME (sec) 28.41	PERFORMANCE	SPROCKET	SPEED (rpm) 382.09	/ ENERGY	ENGINE SPEED (rpm) 2600.00	DRIVE	SPROCKET MOTOR	TORQUE HC (ft-1b) 137.26	CURRENT (amps) 14121.70
NOISSI	MAX. VELOCITY (mph) 45.00	SSION	RADIUS (ft) O	CLE PE	INNER SPR	WER W	Ì	ENT LOSS u)	ECTRIC	INNER SP	)   	
ΣΙ	VELC Omp	SIW	GRADE F (%) 7.74	VEHICL	I	HORSEPOWER (hp)	ENGINE	SEGMENT ENERGY LOSS (btu) 3541.20	   ELEC 		SPEED (rpm) 6368.16	VOLTAGE (volts) 9.55
* * * *	SURFACE  COMPACTED SOIL	* * *	DISTANCE (ft) 1000	***		LATERAL ACCELERATION (g's) 0.000	* * * *	CUMMULATIVE ENERGY USED (btu) 477383.10	本学等等		GENERATUR POWER (KW) 269.79	BUSS CURRENT (amps) 28243.41
	USER		SEGMENT NO. (#) 16			TRACTIVE EFFORT (K-1bs) 5.04		SEGMENT ENERGY (btu) 10024.34		!	GENERATOR SPEED (rpm) 10400.00	BUSS VOL.TAGE (volts) 9.55
	COURSE  DATA INPUT BY		LAP NO. (#)			FORWARD VELOCITY (mph) 24.00	-151	HORSEPOWER GENERATED (hp) 499.21		İ	1. [3]	

	ELECTRIC DRIVE TYPE 		RANGE ESTIMATE (miles) 176.08		NET DRIVE	EFFICIENCY (%) 64.68		FUEL ECONOMY (mpg) 1.01			JWER 19	D POWER (Kw) 15.0
	ENGINE SCHEDULING  CONSTANT		AVB. FORWARD VELOCITY (mph) 8.39			TORQUE (ft-1b) 2089.29		FUEL REMAINING (gal.) 165.29		OUTER SPROCKET MOTOR	HORSEPOWER (hp) 3 166.49	FIEL
	30 H			***	SPROCKET	SPEED (rpm) 405.97	ů.	 ) 88		ER SPROC	TORQUE (ft-1b) 129.23	CURRENT (amps) 13296.29
**	ENGINE 	* * *	CUMMULATIVE TIME (sec) 1381.61	1	OUTER SPR	HORSEFOWER (hp) 161.49	* * * *	FUEL CONSUMED (gal.) 0.188	* * * *	TUO	SPEED (rpm) 6766.17	VOLTAGE (volts) 10.15
PARAMETERS 	VEHICLE	SE DATA	CUMMULATIVE DISTANCE (ft) 17000	ANCE DATA		TORQUE HOR((ft-1b) 2089.29 10	SGY DATA	FUEL CONSUMPTION (1b/hr) 199.70	JE DATA	OR .	HORSEPOWER (hp) 166.49	FIELD POWER (Kw) 15.0
- 1	MAX. LAT ACCEL. (g's) 0.50	COURSE	TIME (cor) 26.74	PERFORMANCE	SPROCKET	SPEED (rpm)	/ ENERGY	ENGINE SPEED (rpm) 2600.00	IC DRIVE	SPROCKET MOTOR	TORQUE HC (ft-1b) 129.23	CURRENT F (amps)
NOISSIM	MAX. VELGCITY (mph) 45.00	MISSIM	GRADE RADIUS (#+)	VEHICLE	INNER	HORSEPOWER (hp) 161.49	ENGINE	SEGMENT ENERGY LOSS (btu) 3333.69	ELECTRIC	INNER	 SPEED (rpm) 6766.17	VOLTAGE (volts)
***	SURFACE 	***	DISTANCE GF (f+) ( 1000	***		LATERAL ACCELERATION (g's) 0.000	* * *	CUMMULATIVE ENERGY USED (btu) 486821.00	***		GENERATOR POWER (Kw) 269,89	BUSS CURRENT (amps) 26592.58
	USER		SEGMENT NO. (#) 17			TRACTIVE EFFORT (K-1bs) 4.75		SEGMENT ENERGY (btu) 9437.89			GENERATOR SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 10.15
	COURSE  DATA INPUT BY		LAP NO. 6 (#)			FORWARD VELOCITY (mph)	-152	HORSEPOWER GENERATED (hp) 499.38			96 20	

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	ELECTRIC DRIVE TYPE 		RANGE ESTIMATE (miles) 186.27		NET DRIVE EFFICIENCY (%) 64.69		FUEL ECONOMY (mpg) 1.06				85
	ENGINE SCHEDULING DI CONSTANT H		G. FORWARD VELOCITY (mph) 8.73		TORQUE (ft-1b) 1975.01		FUEL REMAINING (gal.) 165.12		r MOTOR	HORSEPOWER (hp) 166.64	FIELD POWER (KW) 15.0
	SCHEI		Ą	* * *	SPROCKET SPEED (rpm) 429.85	L			ER SPROCKET MOTOR	TORQUE (ft-1b) 122.17	CURRENT (amps) 12569.02
* * * * * * *	ENGINE	* * *	CUMMULATIVE TIME (sec) 1406.87	** PHU	OUTER SPR(  HORSEPOWER (hp) 161.64	* * * *	FUEL CONSUMED (gal.) 0.178	***	OUTER	SPEED (rpm) 7164.18	VOLTAGE (volts) 10.75
PARAMETERS 	T. VEHICLE	SE DATA	CUMMULATIVE DISTANCE (ft) 18000	Ī	TORQUE HOR (ft-1b) 1975.01 1	RGY DATA	FUEL CONSUMPTION (1b/hr) 199.89	/E DATA	OR	 HORSEPOWER (hp) 166.64	FIELD POWER (Kw) 15.0
1	MAX. LAT ACCEL. (g's) 0.50	COURSE	TIME (sec) 25.25	PERFORMANCE	SPROCKET SPEED (rpm) 429.85	/ ENERGY	ENGINE SPEED (rpm) 2600.00	C DRIVE	SPROCKET MOTOR	TORQUE HO (ft-1b) 122.17	CURRENT F (amps) 12569.02
NOISSIW	MAX. VELOCITY (mph) 45.00	MISSION	GRADE RADIUS (%) (ft) 6.25 0	VEHICLE P	INNER SF  HDRSEPOWER (hp) 161.64	ENGINE	SEGMENT ENERGY LOSS (btu) 3150.21	ELECTRIC	INNERS	SPEED TO (+ 7164.18 1	VOLTAGE CUI (volts) (au 10.75 125
* * *	'SURFACE 	* * *	DISTANCE GF (ft) ( 1000 6	> * * * *	LATERAL ACCELERATION (g's) 0.000	***	CUMMULATIVE ENEKGY USED (btu) 495741.60	* * *	0 0 0 0 0	CLACINHOR POWER (KW) 270.14	BUSS CURRENT (amps) 25138.04
			SEGMENT NJ. (#) 18		TRACTIVE EFFORT (K-1bs)		SEGMENT ENERGY (btu) 8920.53			SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 10.75
	COURSE  DATA INPUT BY USER		LAP NO. 8 (#)		FORWARD VELOCITY (mph) 27.00	D 150	HORSEPOWER GENERATED (hp) 499.77		ũ	1 0	
						B <b>-</b> 153					

	ELECTRIC DRIVE TYPE 		RANGE ESTIMATE (miles) 196.79		NET DRIVE	EFFICIENCY (%) 64.68		FUEL ECONOMY (mpg) 1.12			ER }	O O
	ENGINE SCHEDULING 		AVG. FORWARD VELOCITY (mph) 9.06			TORQUE (ft-1b) 1869.40		FUEL REMAINING (gal.) 164.95		SPROCKET MOTOR	HORSEFOWER (hp) 166.49	FIELD POWER (KW)
				* * *	SPROCKET	SPEED (rpm) 453.73	ı.	1ED			TORQUE (ft-1b) 115.63	CURRENT (amps) 11896.94
*	ENGINE VTA-903	*	CUMMULATIVE TIME (sec) 1430.79	1	OUTER SPRO	HORSEPOWER (hp) 161.50	* * *	FUEL CONSUMED (gal.) 0.168	本本本本	OUTER	SPEED (rpm) 7562.19	VOLTAGE (volts) 11.34
PARAMETERS	VEHICLE	SE DATA	CUMMULATIVE DISTANCE (ft) 19000	AANCE DATA		TORQUE HOR: (ft-1b) 1869.40 1	ATAC YOS	FUEL CONSUMPTION (1b/hr) 199.71	JE DATA	OR	 HORSEPOWER (hp) 166.49	FIELD POWER (Kw) 15.0
	MAX. LAT ACCEL. (g's) 0.50		TIME (sec) 23.92	PERFORMANCE 	SPROCKET	SPEED (rpm) 453.73	/ ENERGY	ENGINE SPEED (rpm) 2600.00	C DRIVE	SPROCKET MOTOR	TORQUE HO (+t-1b) 115.43	CURRENT F (amps) 11896.94
NOISSIM	MAX. VELOCITY (mph) 45.00	NOISSIM	GRADE RADIUS (%) (ft) 5.6 0	VEHICLE	INNER	HORSEFOWER (hp) 161.50	ENGINE	SEGMENT ENERGY LOSS (btu) 2982.82	ELECTRIC	INNER	SPEED T (rpm) (7562.19	VOLTAGE C (valts) (
***	SURFACE  COMPACTED SOIL	***	DISTANCE GR (ft) ( 1000 S	>   * * * *		LATERAL ACCELERATION (g's) 0.000	***	CUMMULATIVE ENERGY USED (btu) 504186.20	**		GENERATOR POWER (Kw) 269,90	BUSS CURRENT (amps) 23793.88
			SEGMENT NO. (#) 19			TRACTIVE EFFORT (K-1bs) 4.25		SEGMENT ENERGY (btu) 8444.59			GENERATOR SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 11.34
	COURSE  DATA INPUT BY USER		LAF NO. (#)			FORWARD VELOCITY (mph) 28.50	.54	HORSEPOWER GENERATED (hp) 499.39			GE 05	

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	ELECTRIC DRIVE TYPE 		RANGE ESTIMATE (miles) 207.56		AUT AUT	EFFICIENCY (%) 64.66		FUEL ECONOMY (mpg) 1.19			ıκ	WER
	1		G. FORWARD VELOCITY (mph) 9.39			TORQUE (ft-1b) 1772.51		FUEL REMAINING (gal.) 164.79		T MOTOR	HORSEPOWER (hp) 166.17	FIELD POWER (K₩) 15.0
	ENGINE SCHEDULING 		AV	* * * * *	SPROCKET	SPEED (rpm) 477.61				R SPROCKET MOTOR	TORQUE (ft-1b) 109.64	CURRENT (amps) 11280.33
* * * *	ENGINE  VTA-903	***	CUMMULATIVE TIME (sec) 1453.52	1	OUTER SPRO	HORSEPOWER (hp) 161.19	* * *	FUEL CONSUMED (gal.) 0.160	***	OUTER	SPEED (rpm) 7960.20	VOL.TAGE (volts) 11.94
PARAMETERS	VEHICLE	E DATA	CUMMULATIVE DISTANCE (ft) 20000	ANCE DATA		TORQUE HORS (ft-1b) 1772.51 14	БУ ВАТА	FUEL CONSUMPTION (1b/hr) 199.31	E DATA	¥.	HORSEFOWER (hp) 166.17	FIELD POWER (Kw) 15.0
	MAX. LAT. ACCEL. (g's) 0.50	COURSE	TIME (sec) 22.73	PERFORMANCE	SPROCKET	SPEED 1 (rpm) 477.61	/ ENERGY	ENGINE SPEED (rpm) 2600.00	C DRIVE	SPROCKET MOTOR	TORGUE HO! (+t-1b) 109.64	CURRENT F (amps)
NOISSIM	MAX. VELOCITY (mph) 45.00	MISSION	E RADIUS (+t) 0	ICLE	INNER S	 HORSEFOWER (hp) 161.19	ENGINE	SEGMENT ENERGY LOSS (btu) 2830.39	ELECTRIC	INNER	SPEED 1 (rpm) (	VOLTAGE C (volts) (11.94 11
***	SURFACE  COMFACTED SOIL	***	DISTANCE GRADE (ft) (%) 1000	**** ***		LATERAL ACCELERATION (g's) 0.000	***	CUMMULATIVE ENERGY USED (btu) 512195.20	***		GENERATOR FOWER (KW) 269,38	BUSS CURRENT (amps) 22560.66
			SEGMENT NO. (#) 20			TRACTIVE EFFORT (K-1bs)		SEGMENT ENERGY (btu) 8009,08			GENERATOR SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 11.94
	COURSE  DATA INPUT BY USER		LAP NO. SE (#)			FORWARD VELOCITY (mph)	-155	HORSEPOWER GENERATED (hp) 498.57			GE 10	

	ELECTRIC DRIVE TYPE 		RANGE ESTIMATE (miles) 217.30		HOTAN	EFFICIENCY (%) 64.69		FUEL ECONOMY (mpg) 1.24			WER 5	.D POWER (Kw) 15.0
	ENGINE SCHEDULING 		AVG. FORWARD VELOCITY (mph) 9.71			TORQUE (ft-1b) 1692.92		FUEL REMAINING (gal.) 164.64		ET MOTOR	HORSEFOWER (hp) 166.65	FIELD POWER (Kw) 15.0
	SCHE			***	SPROCKET	SPEED (rpm) 501.49				OUTER SPROCKET MOTOR	TORQUE (ft-1b) 104.72	CURRENT (amps) 10773.84
***	ENGINE 	***	CUMMULATIVE TIME (sec) 1475.16	i	OUTER SPRO	HORSEPOWER (hp) 161.65	* * *	FUEL CONSUMED (gal.) 0.153	***	OUTE	SPEED (rpm) 8358.22	VOLTAGE (volts) 12.54
PARAMETERS 	VEHICLE	SE DATA	CUMMULATIVE DISTANCE (ft) 21000	MANCE DATA		TORQUE HOR (ft-1b) 1692.92 1	RGY DATA	FUEL CONSUMPTION (1b/hr) 199.90	JE DATA	OR	 HORSEPOWER (hp) 166.85	FIELD FOWER (Kw) 15.0
- 1	MAX. LAT ACCEL. (g's) 0.50	A COURSE	TIME (sec) 21.64	PERFORMANCE	SPROCKET	SPEED (rpm) 501.49	/ ENERGY	ENGINE SPEED (rpm) 2600.00	C DRIVE	SPROCKET MOTOR	TORQUE HC (ft-1b)	CURKENT (amps)
MISSION	MAX. VELOCITY (mph) 45.00	NOISSIM	E RADIUS (ft) 0	VEHICLE	INNER	 HORSEPOWER (hp) 161.65	ENGINE	SEGMENT ENERGY LOSS (btu) 2700.24	ELECTRIC	INNER	SPEED T (rpm) (8358.22	VOLTAGE C (volts) ( 12.54 10
***		İ	GRADE (%)	く同く				IVE SED O	1			•
*	SURFACE 	***	DISTANCE (ft) 1000	* * *		LATERAL ACCELERATION (g's) 0.000	***	CUMMULATIVE ENERGY USED (btu) 519841.70	* * * *		GENERATOR POWER (KW) 270.15	BUSS CURRENT (amps) 21547.67
			SEGMENT NO. (#) 21			TRACTIVE EFFORT (K-1bs) 3.85		SEGMENT ENERGY (btu) 7646.40			GENERATOR SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 12.54
	COURSE  DATA INPUT BY USER		LAF NO. S (#)			FORWARD VELOCITY (mph)	156	HORSEPOWER GENERATED (hp) 499.79			9E 10	

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	ELECTRIC DRIVE TYPE HOPO1 P-G		RANGE ESTIMATE (miles) 228.00		NET DRIVE	EFFICIENCY (%) 64.67		FUEL ECONOMY (mpg) 1.30			JWER ) 40	FIELD POWER (Kw) 15.0
	ENGINE SCHEDUL.ING		AVG. FORWARD VELOCITY (mph) 10.03			TORQUE (ft-1b) 1613.57		FUEL REMAINING (gal.) 164.49		SPROCKET MOTOR	HORSEPOWER (hp) 1 166.40	
	SCHE			崇字丰字	SPROCKET	speed (rpm) 525.37		1ED			TORQUE (ft-1b) 99.81	CURRENT (amps) 10268.82
* * * *	ENGINE  VTA-903	***	CUMMULATIVE TIME (sec) 1495.82		OUTER SPRO	HÖRSEFOWER (hp) 161.41	***	FUEL CONSUMED (gal.) 0.145	* * *	OUTER	SPEED (rpm) 8756.23	VOLTAGE (volts) 13.13
FARAMETERS	VEHICLE	SE DATA	CUMMULATIVE DISTANCE (ft) 22000	MANCE DATA		TORQUE HÖR9 (ft-1b) 1613.57 14	RGY DATA	FUEL CONSUMPTION (1b/hr) 199,59	VE DATA	TOR	HORSEPOWER (hp) 166.40	FIELD POWER (Kw) 15.0
	MAX. LAT ACCEL. (g's) 0.50	4 COURSE	TIME (sec) 20.66	PERFORMANCE	SPROCKET	SPEED (rpm) 525.37	/ ENERGY	ENGINE SPEED (rpm) 2600.00	IC DRIVE	SPROCKET MOTOR	TORQUE H (ft-1b) 99.81	CURRENT (amps) 10268.82
NOISSIM	MAX. VELOCITY (mph) 45.00	NOISSIM	)E RADIUS (ft)	ICLE	INNER	HORSEPOWER (hp) 161.41	ENGINE	SEGMENT ENERGY LOSS (btu) 2575.19	ELECTRIC	INNER	SPEED (rpm) 8756.23	VOLTAGE (volts) 13.13
本本本本	SURFACE	* * *	DISTANCE GRADE (41) (2) (2)	工川〇 ****		LATERAL ACCELERATION (g's) 0.000	****	CUMMULATIVE ENERGY USED (btu) 527131.10	* * *	l	GENERATOR POWER (KW) 269,75	EUSS CURRENT (amps) 20537.63
			SEGMENT NO. (#) 22			TRACTIVE EFFORT (K-1bs)		SEGMENT ENERGY (btu) 7289.51		-	GENERATOR SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 13.13
	COURSE  DATA INPUT BY USER		LAP NO. SI (#) 1			FORWARD VELOCITY (mph)	B-15	HORSEPOWER GENERATED (hp) 499.15			96	

	ELECTRIC DRIVE TYPE HOPOl P-G		RANGE ESTIMATE (miles) 238.15		NET DRIVE	EFFICIENCY (%) 64.68		FUEL ECONOMY (mpg) 1.36			Ľ III	DWER 5
	ENGINE DESCHEDULING DESCHEDULING DESCHEDULING DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPT		AVG. FORWARD VELOCITY (mph) 10.35			TORQUE (ft-1b) 1544,73		FUEL REMAINING (gal.) 164.35		ET MOTOR	HORSEPOWER (hp) 166.54	FIELD POWER (Kw) 15.0
	SCHE			*	CKET	SPEED (rpm) 549.25				OUTER SPROCKET MOTOR	TOKQUE (ft-1b) 95.55	CURRENT (amps) 9830.71
* * *	ENGINE	* * *	CUMMULATIVE TIME (sec) 1515.59	* * * * U L	OUTER SPROCKET	HORSEPOWER (hp) 161.54	* * * *	FUEL CONSUMED (gal.) 0.139	****	OUTE	SPEED '(rpm) 9154.25	VOLTAGE (valts) 13.73
PARAMETERS	VEHICLE 19.5 TON	E DATA	CUMMULATIVE DISTANCE (ft) 23000	ANCE DATA		TORQUE HORS (ft-1b) 1544.73 14	GY DATA	FUEL CONSUMPTION (15/hr) 199.77	E DATÁ	ĸ	 HORSEPOWER (hp) 166.54	FIELD FOWER (Kw)
[	MAX. LAT. ACCEL. (g's) O.SO	A COURSE	TIME (sec) 19.76	PERFORMANCE	SPROCKET	SPEED 1 (rpm) (549.25 1	/ ENERGY	ENGINE SPEED (rpm) 2600.00	IC DRIVE	INNER SFROCKET MOTOR	TORQUE HOF (ft-1b) 95.55	CURRENT FI (amps) 9830.71
MISSIM	MAX. VELOCITY (mph) 45.00	MISSIM	)E RADIUS (ft) 56 0	ICLE	INNER	 HORSEPOWER (hp) 161.54	ENGINE	SEGMENT ENERGY LOSS (btu) 2464.48	ELECTRIC	INNER	SPEED 1 (rpm) (9154.25	VOLTAGE C (volts) (13.73 5
***	SURFACE COMPACTED SOIL	* * * *	DISTANCE GRADE (%) (%) 3.56	エ山ン・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・		LATERAL ACCELERATION (g's) 0.000	***	CUMMULATIVE ENERGY USED (btu) 534108.80	· ***		GENERATOR POWER (Kw) 269.98	BUSS CURRENT (amps) 19661.41
			SEGMENT NO. (#) 23			TRACTIVE EFFORT (K-1bs)		SEGMENT ENERGY (btu) 6977.67			GENERATOR SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 13.73
	COURSE  DATA INPUT BY USER		LAP NO. S (#)			FORWARD VELOCITY (mph)	-158 <sup>-</sup>	HORSEPOWER GENERATED (hp) 499.52			9E 10	

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	ELECTRIC DRIVE TYPE 		RANGE ESTIMATE (miles) 248.35		<u>i</u>	NEI DKIVE EFFICIENCY (%) 64.69		FUEL ECONOMY (mpg) 1.42			WER 4	D FOWER (Kw) 15.0
	ENGINE SCHEDULING		AVG. FORWARD VELOCITY (mph) 10.67			TORQUE (ft-1b) 1481.28		FUEL REMAINING (gal.) 164.22		SPROCKET MOTOR	HORSEPOWER (hp) 166.64	FIELD FOWER (KW)
	SCHE			*	DKET	SPEED (rpm) 573.14				R SPROCK	TORQUE (ft-1b) 91.63	CURRENT (amps) 9426.91
* * *	ENGINE 	**	CUMMULATIVE TIME (sec) .	****	OUTER SPROCKET	HORSEPOWER (hp) 161.64	* * * *	FUEL CONSUMED (gal.) 0.133	***	OUTER	sPEED (rpm) 9552.26	VOLTAGE (volts) 14.33
PARAMETERS	VEHICLE	SE DATA	CUMMULATIVE DISTANCE (ft) 24000	MANCE DATA		TORQUE HOR( (ft—1b) 1481.28	RGY DATA	FUEL CONSUMPTION (1b/hr) 199.90	VE DATA	TOR	HORSEFOWER (hp) 166.64	FIELD POWER (Kw) 15.0
i	MAX. LAT. ACCEL. (g's) 0.50	A COURSE	TIME (sec) 18.94	PERFORMANCE 	SPROCKET	S73.14	/ ENERGY	ENGINE SPEED (rpm) 2600.00	C DRIVE	SPROCKET MOTOR	TORQUE H (ft-1b) 91.63	CURRENT (amps) 9426.91
NOISSIM	MAX. VELOCITY (mph) 45.00	MISSION	RADE RADIUS (%) (ft) 3.15 O	VEHICLE	INNER	HORSEPOWER (hp) 161.64	ENGINE	SEGMENT ENERGY LOSS (btu) 2362.68	ELECTRIC	INNER	SPEED 1 (rpm) (	VOLTAGE (volts) (14.33
* * * *	SURFACE 	***	DISTANCE GRADE (ft) (%) 1000 3.15	**		LATERAL ACCELERATION (g's) 0.000	* * * *	CUMMULATIVE ENEKGY USED (btu) 540799.30	* * * *		GENERAIUR POWER (Kw) 270.14	BUSS CURRENT (amps) 18853.83
	USER CO		SEGMENT ND. (#) 24			TRACTIVE EFFORT (K-1bs) 3.37		SEGMENT ENERGY (btu) 6690.49		•	GENERATOR SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 14.33
	COURSE  DATA INPUT BY		LAP NO. S (#)			FORWARD VELOCITY (mph) 36.00	B <b>-</b> 159	HORSEPOWER GENERATED (hp) 499.78			GE 10	

ELECTRIC DRIVE TYPE 		RANGE ESTIMATE (miles) 259.12			EFFICIENCY (%) 64.67		FUEL. ECONOMY (mpg)			ИЕ.R Э	. S. S. S. S. S. S. S. S. S. S. S. S. S.	(
ENGINE HEDULING HEDULING NOSTANT		NG. FORWARD VELOCITY (mph) 10.98			TORQUE (4t-1b)		FUEL REMAINING (gal.) 164.09		KET MOTOR			
3 55   100			**	OCKET	SPEED (rpm) 597.02	<u></u>	:L JMED ) .28			TORQUE (ft-1b 87.8	CURREN (amps) 9035.7	
ENGINE  VTA-903	***	CUMMUL9T1 TIME (sec) 1552,71	1	OUTER SPA	(SEPOWER (hp)	ı		* * *	רטם	SPEED (rpm) 9950.26	VOLTAGE (valts) 14.93	
VEHICLE	SE DATA	CUMMULATIVE DISTANCE (ft) 25000	1		TORQUE HOR (ft-1b) . 1419.81 1		FUEL CONSUMPTION (1b/hr) 199.57	VE DATA	ror	nserower (hp) 166.38	TELD POWER (KW)	
MAX. LA ACCEL. (g's) 0.50	ļ	TIME (sec) 18.18	>ERFOR	SPROCKET	SPEED (rpm) 597.02	/ ENEI	ENGINE SPEED (rpm) 2600.00	1	SPROCKET MOT	- 8		(
MAX. VELOCITY (mph) 45.00	MISSIO	E RADIUS (ft) 5 0	ļ	INNER	 HORSEPOWER (hp) 161.39	ENGINE	SEGMENT ENERGY LOSS (btu) 2266.04	ELECTR	INNER			
JRFACE TED SDIL	***	Ü	リン *****		•	***	CUMMULATIVE ENEKGY USED (btu) 547213.60	***		ENERATOR POWER (KW) 269,72	BUSS CURRENT (amps) 18071.39	
					TRACTIVE EFFORT AC (K-1bs) 3.23		SEGMENT ENERGY (btu) 6414.24				BUSS /OLTAGE (volts) 14.93	
COURSE  DATA INPUT BY (		LAP NO. SE (#) 1			FORWARD VELOCITY (mph) 37.50	B-160	HORSEPOWER GENERATED (hp) 499.11			6EI (		
	SURFACE VELOCITY ACCEL. VEHICLE ENGINE SCHEDULING  (mph) (g's)	SURFACE VELOCITY ACCEL. VEHICLE ENGINE SCHEDULING  (mph) (g's)	SURFACE	SURFACE VELOCITY ACCEL. VEHICLE ENGINE SCHEDULING DEL (mph) (g's) 19.5 TON VTA-903 CONSTANT HOP (ft) (ft) (sec) (ft) (sec) (ft) (sec) (ft) (sec) (ft) (sec) (ft) (sec) (ft) (sec) (ft) (sec) (ft) (sec) (mph) (sec) (ft) (sec) (mph) (sec) (mph) (sec) (ft) (sec) (mph) (sec) (ft) (sec) (mph) (sec) (ft) (sec) (mph) (sec) (ft) (sec) (mph) (sec) (ft) (sec) (mph) (sec) (ft) (sec) (mph) (sec) (ft) (sec) (mph) (sec) (ft) (sec) (mph) (sec) (ft) (sec) (mph) (sec) (ft) (sec) (mph) (sec) (ft) (sec) (mph) (sec) (ft) (sec) (mph) (sec) (ft) (sec) (mph) (sec) (ft) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (mph) (sec) (	SURFACE (mph) (9'5)	SURFACE	Surface	SEGMENT NO.   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compacted Soil   Compact	SURFACE   SURFACE   WELDCITY   MAX, LAT   WEHICLE   ENGINE   SCHEDLLING   DR	SEGRETATION   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED SOIL   COMPACTED 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	ELECTRIC DRIVE TYPE HOPOI F-G		RANGE ESTIMATE (miles) 269.08		NET DRIVE	EFFICIENCY (%) 64.68		FUEL ECONOMY (mpg) 1.54			JWER ) 52	FIELD FOWER (Kw) 15.0
	ENGINE SCHEDUL ING		AVG. FORWARD VELOCITY (mph) 11.30			TORQUE (ft-1b) 1367.17		FUEL REMAINING (gal.) 163.97		OUTER SPROCKET MOTOR	HORSEFOWER (hp) 7 166.62	
	SCHE		Α	***	SPROCKET	SPEED (rpm) 620.90	ų.	L MED 23		ER SPROC	TORQUE (ft-1b) 84.57	CURRENT (amps) 8700.72
***	ENGINE  VTA-903	***	CUMMULATIVE TIME (sec) 1570.19	I	OUTER SPR	HORSEPOWER (hp) 161.63	* * * *	FUEL CONSUMED (gal.) 0.123	**	בחם	SPEED (rpm) 10348.27	VOLTAGE (volts) 15.52
PARAMETERS	VEHICLE 19.5 TON	SE DATA	CUMMULATIVE DISTANCE (ft) 26000	MANCE DATA		TORQUE HOR9 (ft-1b) 1367.17 14	RGY DATA	FUEL CONSUMPTION (1b/hr) 199.87	VE DATA	TOR	 HORSEPOWER (hp) 166.62	FIELD FOWER (Kw) 15.0
1	MAX, LAT. ACCEL. (g's) 0.50	COURSE	TIME (sec)	FERFORMANCE	SPROCKET	SPEED (rpm) 620.90	/ ENERGY	ENGINE SPEED (rpm) 2600.00	IC DRIVE	SPROCKET MOTOR	TORQUE H (ft-1b) 84.57	CURRENT (amps) 8700.72
NOISSIM	MAX. VELOCITY (mph) 45.00	MISSION	GRADE RADIUS (%) (ft) (ft)	VEHICLE F	INNER	HORSEPOWER (hp) 161.63	ENGINE	SEGMENT ENERGY LOSS (btu) 2180.78	ELECTRIC	INNER	SPEED	VOLTAGE (volts) 15.52
***	SURFACE  COMPACTED SOIL	* * * *	DISTANCE GRA(ft) (7) (7) 1000 2.	****		LATERAL ACCELERATION (g's) 0.000	***	CUMMULATIVE ENERGY USED (btu) 553388.80	* * * *		GENERATOR FOWER (KW) 270.11	BUSS CURRENT (amps) 17401.44
			SEGMENT NO. (#) 26			TRACTIVE EFFORT (K-1bs)		SEGMENT ENERGY (btu) 6175.19			GENERATOR SPEED (rpm) 10400.00	BUSS VOLTAGE (volts)
	COURSE  DATA INPUT BY USER		LAP NO. SE (#)			FORWARD VELOCITY (mph) 39.00	B-161	HORSEPOWER GENERATED (hp) 499.73			(H) (H) (H) (H) (H) (H) (H) (H) (H) (H)	

#### 事事事事 ELECTRIC DRIVE PERFORMANCE \*\*\*

	ELECTRIC DRIVE TYPE 		RANGE ESTIMATE (miles) 279.81		NET DRIVE	EFFICIENCY (%) 64.67		FUEL ECONDMY (mpg) 1.60			WER 1	D FOWER (Kw)
	ENGINE SCHEDULING  CONSTANT	٠	AVG. FORWARD VELOCITY (mph) 11.61			TORQUE (ft-1b) 1314.81		FUEL REMAINING (gal.) 163.85		SPROCKET MOTOR	HORSEPOWER (hp) 166.41	FIEL
	SCHE			***	SPROCKET	SPEED (rpm) 644.78		ED 8			TORQUE (ft-1b) 81.33	CURRENT (amps) 8367.49
***	ENGINE	* * *	CUMMULATIVE TIME (sec) 1587.03	DATA **	OUTER SPRO	HORSEPOWER (hp) 161.41	***	FUEL CONSUMED (gal.) 0.118	***	OUTER	SPEED (rpm) 10746.28	VOLTAGE (volts) 16.12
PARAMETERS	VEHICLE	SE DATA	CUMMULATIVE DISTANCE (ft) 27000	- 1		TORQUE HOR (ft-1b) 1314.81 1	GY DATA	FUEL CONSUMPTION (16/hr) 199.60	Æ DATA	DR	HORSEFOWER (hp) 166.41	FIELD FOWER (Kw)
١	MAX. LAT ACCEL. (g's) 0.50	N COURSE	TIME (cer) 16.83	PERFORMANCE	SPROCKET	SPEED (rpm) 644.78	/ ENERGY	ENGINE SPEED (rpm) 2600.00	IC DRIVE	INNER SPROCKET MOTOR	TORQUE HO (ft-1b) 81.33	CURRENT F (amps) 8367.49
NOISSIM	MAX. VELOCITY (mph) 45.00	NOISSIM	GRADE RADIUS	VEHICLE	INNER	 HORSEPOWER (hp) 161.41	ENGINE	SEGMENT ENERGY LOSS (btu) 2098.35	ELECTR	INNER	SPEED (rpm) 10746.28	VOLTAGE (VOLTS) (VOLTS) (VOLTS) (VOLTS)
* * * *	SURFACE 	常本本常	DISTANCE GR (4+) (	> ****		LATERAL ACCELERATION (g's) 0.000	* * * *	CUMMULATIVE ENERGY USED (btu) 559328.50	* * * *		GENERATOR POWER (Kw) 259,75	BUSS CURRENT (amps) 16734.97
			SEGMENT NO. (#) 27			TRACTIVE EFFORT (K-1bs) 2,99		SEGMENT ENEKGY (btu) 5939,78			GENERATOR SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 16.12
	COURSE  DATA INPUT BY USER		LAF NO. (#)			FORWARD VELOCITY (mph) 40.50	-162	HORSEPOWER GENERATED (hp) 499.17			9E 17	

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	ELECTRIC DRIVE TYPE 		RANGE ESTIMATE (miles) 289.76		00 H00	EFFICIENCY (%)		FUEL ECONOMY (mpg) 1.66				ER.
	ΑΙΤ		AVG. FORWARD VELOCITY (mph) 11.91		-	TORQUE (ft-1b) 1269.58		FUEL REMAINING (gal.) 163.73		. MOTOR	HORSEPOWER (hp) 166.63	FIELD FOWER (Kw) 15.0
	ENGINE SCHEDULING CONSTANT			*	OKET	SPEED (rpm) 658.66				R SPROCKET MOTOR	TORQUE (ft-1b) 78.53	CURRENT (amps) 8079.67
***	ENGINE  VTA-903	***	CUMMULATIVE TIME (sec) 1603.26	**** CL	OUTER SPROCKET	HORSEPOWER (hp)	* * *	FUEL CONSUMED (gal.) 0.114	***	OUTER	SPEED (rpm) 11144.29	VOLTAGE (volts) 16.72
FARAMETERS	VEHICLE 19.5 TON	SE DATA	CUMMULATIVE DISTANCE (ft) 28000	1ANCE DATA		TORQUE HORS (ft-1b) 1269.58	SGY DATA	FUEL CONSUMPTION (1b/hr) 199.88	JE DATA	OR	 HORSEPOWER (hp) 166.63	FIELD FOWER (Kw) 15.0
į	MAX. LAT ACCEL. (g's) 0.50	1 COURSE	TIME (sec) 16.23	PERFORMANCE	SPROCKET	SPEED (rpm) 668.66	/ ENERGY	ENGINE SPEED (rpm) 2600.00	C DRIVE	INNER SPROCKET MOTOR	TORQUE HO (+t-1b) 78.53	CURRENT F (amps) 8079.67
NOISSIW	MAX. VELOCITY (mph) 45.00	NOISSIM	RADE RADIUS (%) (+t) 1.74 0	VEHICLE	INNER S	HORSEPOWER (hp) 161.63	ENGINE	SEGMENT ENERGY LOSS (btu) 2025.07	ELECTRIC	INNER	SPEED T (rpm) (	VOLTÄGE C (volts) ( 16.72 8
* * * *	SURFACE  COMPACTED SOIL	***	DISTANCE GRADE (ft) (%) 1000 1.74	3 * * * * * * * * * * * * * * * * * * *		LATERAL ACCELERATION (g's) 0.000	* * *	CUMMULATIVE ENERGY USED (btu) 565062.90	***		GENERATOR POWER (Kw) 270.13	BUSS CURKENT (amps) 16159.34
			SEGMENT NO. (#) 28			TRACTIVE EFFORT (K-1bs) 2.89		SEGMENT ENERGY (btu) 5734.37			GENERATOR SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 16.72
	COURSE  DATA INPUT BY USER		LAP NO. SF (#)			FORWARD VELOCITY (mph) 42.00	B <b>-16</b> 3	HORSEPOWER GENERATED (hp) 499.75			9E 10	

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	ELECTRIC DRIVE TYPE HOPOl P-G		RANGE ESTIMATE (miles) 299.97		TOTAL TEN	EFFICIENCY (%) 64.69		FUEL ECONOMY (mpg) 1.71			INER	D POWER (Kw) 15.0
	ENGINE SCHEDUL ING  CONSTANT		AVB. FORWARD VELOCITY (mph) 12.22			TORQUE (ft-1b) 1226.35		FUEL REMAINING (gal.) 163.62		OUTER SPROCKET MOTOR	HORSEFOWER (hp) 166.71	FIEL
	SC   CO			***	SPROCKET	SPEED (rpm) 692.54		ED O		R SPROCK	TORQUE (ft-1b) 75.86	CURRENT (amps) 7804.55
*	ENGINE 	* *	CUMMULATIVE TIME (sec) 1618.93	١	OUTER SPRO	HDRSEPOWER (hp) 161.71	***	FUEL CONSUMED (gal.)	***	OUTE	SPEED (rpm) 11542.30	VOLTAGE (volts) 17.31
PARAMETERS	VEHICLE 19.5 TON	E DATA	CUMMULATIVE DISTANCE (#+) 29000	ANCE DATA		TORQUE HOR( (ft-1b) 1226.35 14	GY DATA	FUEL CONSUMPTION (16/hr) 199.97	E DATA	ŭ	HORSEPOWER (hp) 166.71	FIELD POWER (Kw) 15.0
1	MAX. LAT. ACCEL. (g's) 0.50	COURSE	TIME (App.)	PERFORMANCE	SPROCKET	SPEED T (rpm) (	/ ENERGY	ENGINE SPEED (rpm) 2600.00	C DRIVE	INNER SPROCKET MOTOR	TORQUE HOR (ft-1b) 75.86 1	CURRENT FI (amps) 7804.55
NOISSIE	MAX. VELOCITY (mph) 45.00	NOISSIM	RADE RADIUS	VEHICLE F	INNER SP	HORSEPOWER (hp) 161.71	ENGINE	SEGMENT ENERGY LOSS (btu) 1955,77	ELECTRIC	INNER S	SPEED TOP (rpm) (+1	VOLTAGE CUR (volts) (ar 17.31 78
* * * *	SURFACE 	* * *	,DISTANCE GRADE	***		LATERAL ACCELERATION (g's) 0.000	****	CUMMULATIVE ENEKGY USED (btu) 570601.60	***		GENERATOR POWER (KW) 270.25	BUSS CURRENT (amps) 15609.09
			SEGMENT NO. (#) 29			TRACTIVE EFFORT (K-1bs) 2.79		SEGMENT ENERGY (btu) 5538.76			GENERATOR SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 17.31
	COURSE  DATA INPUT BY USER		LAP ND. (#)	·		FORWARD VELOCITY (mph)	64	HORSEPOWER GENERATED (hp) 499.94			. 10	·

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•	ELECTRIC DRIVE TYPE HOPOl P-G		RANGE ESTIMATE (miles) 317.52		NET DRIVE	EFFICIENCY (%) 64.49		FUEL ECONOMY (mpg) 1.81			OWER	FIELD POWER (Kw) 15.0
	ENGINE SCHEDULING  CONSTANT		AVG. FORWARD VELOCITY (mph) 12.52			TORQUE (ft-1b) 1159.39		FUEL REMAINING (gal.) 163.52		OUTER SPROCKET MOTOR	E HORSEPOWER b) (hp) 71 163.04	
	30 H			***	SPROCKET	SPEED (rpm) 716.42	.l.	L MED 04		ER SPRO	TORQUE (ft-1b) 71.71	CURRENT (amps) 7378.37
***	ENGINE  VTA-903	***	CUMMULATIVE TIME (sec) 1634.08	** DATA	OUTER SPRO	HORSEPOWER (hp) 158.15	***	FUEL CONSUMED (gal.) 0.104	***	TUO	SPEED (rpm) 11940,30	VOLTABE (volts) 17.91
PARAMETERS	VEHICLE	E DATA	CUMMULATIVE DISTANCE (ft) 30000			TORQUE HOR (ft-1b) 1159.39 1	GY DATA	FUEL CONSUMPTION (1b/hr) 195.43	JE DATA	.0R	HORSEFOWER (hp) 163.04	FIELD POWER (KW)
1	MAX. LAT. ACCEL. (g's) 0.50	A COURSE	TIME (sec) 15.15	FERFORMANCE	SPROCKET	SPEED (rpm) 716.42	/ ENERGY	ENGINE SPEED (rpm) 2600.00	IC DRIVE	SPROCKET MOTOR	ORQUE ft-1b) 71.71	CURRENT (amps)
MISSIM	MAX. VELUCITY (mph) 45.00	NOISSIM	DE RADIUS	ICLE	INNER	HORSEPOWER (hp) 158.15	ENGINE	SEGMENT ENERGY LOSS (btu) 1865.52	ELECTRIC	INNER	SPEED (rpm) 11940.30	VOLTAGE (volts) 17.91
* * * *	SURFACE COMPACTED SOIL	***	DISTANCE GRADE (%) (%) (%) 1000	工山〇 ****		LATERAL ACCELERATION (g's) 0.000	* * * *	CUMMULATIVE ENERGY USED (btu) 575854.50	* * *		GENERATOR POWER (Kw) 264.30	BUSS CURRENT (amps) 14756.74
			SEGMENT NO. (#)			TRACTIVE EFFORT (K-1bs) 2.64		SEGMENT ENERGY (btu) 5252.86		-	GENERATOR SPEED (rpm) 10400.00	BUSS VOLTAGE (valts) 17.91
	COURSE  DATA INPUT BY USER		LAP NO. Si (#)			FORWARD VELDCITY (mph) 45.00	3-165	HORSEPOWER GENERATED (hp) 490.49			<b>.</b>	

VEHICLE MISSION SIMULATION ELECTRIC

### DC HOMOPOLAR MOTOR DRING System 40.070N

FMC / NORTHERN ORDNANCE DIVISION MINNEAPOLIS, MINNESOTA

REVISION DATE: 06/05/85 RUN DATE: 08-22-1985

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ELECTRICALLY DRIVEN, TRACKED VEHICLE PERFORMANCE IS SIMULATED BY THIS PROGRAM. DETAILED ASPECTS OF VEHICLE PERFORMANCE INVESTIGATED USING THE FOUR RESIDENT SUB-PROGRAMS LISTED BELOW. THE SUB-PROGRAM IN USE IS IDENTIFIED WITH AN ASTERISK. CAN BE INVESTIGATED USING THE FOUR RESIDENT SUB-PROGRAMS LISTED BELOW.

- \* 1.) ELECTRIC DRIVE PERFORMANCE
- POWER DRIVE PARAMETERS. ENERGY USAGE, HEAT REJECTION, AND FUEL IMPACT ARE ALSO STEADY STATE VEHICLE PERFORMANCE ANALYSIS WITH DETAILED EMPHASIS ON ELECTRIC
- 1 2.) VEHICLE ACCELERATION PERFORMANCE
- DYNAMIC VEHICLE PERFORMANCE ANALYSIS WHICH REALISTICALLY SIMULATES GROSS VEHICLE MISSION OVER ALL TERRAIN CONDITIONS. ACCELERATION, DECELERATION, BRAKING AND CONSTANT VELOCITY CONDITIONS ARE CONSIDERED.
- ı ROUTINE ACCELERATION DYNAMICS -M
- DETAILED ANALYSIS OF FULL POWER VEHICLE ACCELERATION DURING TURNING AND NON-TURNING MANEUVERS ON USER SELECTED GRADES AND SURFACES. INCREMENTAL DYNAMIC PARAMETERS ARE GENERATED AND TABULATED.
  - 4.) REDUCTION DYNAMICS ROUTINE

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DETAILED ANALYSIS OF SPEED/TORQUE LOADING OF ALL VEHICLE POWER TRAIN REDUCTION ELEMENTS. FINAL SPROCKET DRIVES AND DIESEL ENGINE INTERFACE ARE INCLUDED IN ELEMENTS. ANALYSIS. 

#### FRONTAL AREA, sq. ft.= 68.25 DAHA 回しいにはいる COURSE: DATA INPUT BY USER DHUD SURFACE: COMPACTED SOIL

### GROSS VEHICLE WEIGHT, tons= 40.0

TREAD WIDTH, in. = 109.84 COEFFICIENT OF DRAG= 1

COEFFICIENT OF FRICTION= .7

FERFORMANCE LIMITS

TRACK LENGTH, in. = 183.07

NUMBER OF SPROCKET TEETH= 11 TRACK PITCH, in. = 7.625 MAX. COURSE VELOCITY, mph= 45

ROLLING RESISTANCE, 16. per ton= 100 MAX. LAT. ACCEL., g's= .5

SPEED FOR MIN. FUEL, rpm= MAX. SPEED, rpm= 3725

MAX. FOWER, hp= 1000

ENGINE: AD-1000

2400 COOLING LOSSES, % Ghp=

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GENERATOR EFF., %= MOTOR KM V/Krpm-A=

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PEAK MOTOR EFF., %=

TYPE: HoPol F-G

DALE

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ENGINE DATA

ELECTRIC

GEN. KG, V/Krpm-A= .005

INLET/EXHAUST LOSSES, % Ghp=

AUXILIARY POWER hp= 12

FUEL CAPACITY, gal. = 350

SCHEDULING: CONSTANT

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MAXIMUM VELOCITY, mph=

	ELECTRIC DRIVE TYPE 		RANGE ESTIMATE (miles) 32.45		1 1 1 1	NET DRIVE EFFICIENCY (%) 56.69		FUEL ECONOMY (mpg) 0.09			WER 4	D POWER (Kw) 15.0
	ENGINE SCHEDUL ING		AVG. FORWARD VELOCITY (mph) 4.70			TORQUE (ft—1b) 25126.20		FUEL REMAINING (gal.) 347.96		OUTER SPROCKET MOTOR	HORSEPOWER ) (hp) 3 291.84	F JEL
	SCHE			***	SPROCKET	SPEED (rpm) 59.17	4	IL JMED 1. )		TER SPROC	TORQUE (ft-1b) 1036.13	CURRENT (amps) 130678.10
*	ENGINE AD-1000	* * *	CUMMULATIVE TIME (sec) 145.07	İ	OUTER SPR	HORSEPOWER (hp) 283.09	***	FUEL CONSUMED (gal.) 2.043	* *	רטם	SPEED (rpm) 1479.34	VOLTAGE (volts) 2.22
PARAMETERS	VEHICLE	SE DATA	CUMMULATIVE DISTANCE (ft) 1000	MANCE DATA		TORQUE HOR (+t-1b) 25126.20 2	AGY DATA	FUEL CONSUMPTION (1b/hr) 399.41	VE DATA	TOR	HORSEPOWER (hp) 291.84	FIELD POWER (Kw) 15.0
1	MAX. LAT. ACCEL. (g's) 0.50	1 COURSE	TIME (sec)	PERFORMANCE	SPROCKET	SPEED (rpm) 59.17	/ ENERGY	ENGINE SPEED (rpm) 3200.00	C DRIVE	INNER SPROCKET MOTOR	TORQUE H( (ft-1b) 1036.13	CURRENT (amps) 130678.10
NOISSIM	MAX. VELOCITY (mph) 45.00	MISSIM	E RADIUS (ft) O	VEHICLE F	INNER S	HORSEPOWER (hp) 283.09	ENGINE	SEGMENT ENERGY LOSS (btu) 44358.01	ELECTRIC	INNER	SPEED T (rpm) (1479.34 1	VOLTAGE C (volts) ( 2.22 130
***	SURFACE 	* * * *	DISTANCE GRADE (ft) (%) 1000 60	****   ****		LATERAL ACCELERATION (g's) 0.000	***	CUMMULATIVE ENERGY USED. (btu) 102412,50	* * * *		GENERALUR POWER (Kw) S79.95	BUSS CURRENT (amps) 261356.30
			SEGMENT NO. (#)			TRACTIVE EFFORT (K-1bs) 45.16		SEGMENT ENERGY (btu) 102412.50			GENERATOR SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 2.22
	COURSE  DATA INPUT BY USER		LAF NG. S (#)		·	FORWARD VELOCITY (mph) 4.70	3-167	HORSEPOWER GENERATED (hp) 998.78			ag 1	

	ELECTRIC DRIVE TYPE		RANGE ESTIMATE (miles)			NET DRIVE EFFICIENCY (%) 63.43		FUEL ECONOMY (mpg) 0.12			Œ	WER
	ENGINE SCHEDULING I		AVG. FORWARD VELOCITY (mph) 5.27			TORQUE (ft—1b) 21941.26		FUEL REMAINING (gal.) 346.36		SPROCKET MOTOR	HORSEPOWER (hp)	FIELD POWER (Kw) 15.0
	SCHE		₹	***	SPROCKET	SPEED (rpm) 75.54	ų.				TORQUE (ft-1b) 904,79	CURRENT (amps) 101951.80
* * *	ENGINE  AD-1000	* * *	CUMMULATIVE TIME (sec) 258,70		OUTER SPR	HORSEPOWER (hp) 315.58	* * * *	FUEL CONSUMED (gal.) 1.593	*	OUTER	SPEED (rpm) 1888.52	VOLTAGE (volts) 2.83
FARAMETERS 	VEHICLE 	E DATA	CUMMULATIVE DISTANCE (ft) 2000	ANCE DATA		TORQUE HOR: (ft—1b) 21941.26 3	бү рата	FUEL CONSUMPTION (16/hr) 397.63	E DATA	œ	HORSEPOWER (hp) 325.34	FIELD POWER (Kw) 15.0
- 1	MAX, LAT, ACCEL, (g's) 0.50	I COURSE	TIME (sec) 113.64	PERFORMANCE 	SPROCKET	SPEED T (rpm) (75.54 21	/ ENERGY	ENGINE SPEED (rpm) 3200.00	C DRIVE	SPROCKET MOTOR	TORQUE HOR (ft-1b)	CURRENT FII (amps) 101951.80
NOISSIM	MAX. VELOCITY (mph) 45.00	MISSION	DE RADIUS (ft) .4 0	ICLE	INNER SE	HORSEPOWER (hp) 315.58	ENGINE	SEGMENT ENERGY LOSS (btu) 29228.82	ELECTRIC	INNER	SPEED TC (+	VOLTAGE CU (volts) (a 2.83 1019
* * *	SURFACE  COMPACTED SOIL	***	DISTANCE GRADE (ft) (%) 1000 49.4	11111111111111111111111111111111111111		LATERAL ACCELERATION (g's) 0.000	* * * *	CUMMULATIVE ENERGY USED (btu) 182336.90	* * * *	OCTAGON	CENERALON FOWER (Kw) 577.62	BUBS CURRENT (amps) 203903.50
			SEGMENT NO. (#) 2			IRACIIVE EFFORT (K-1bs) 39.44		SEGMENT ENERGY (btu) 79924,40		ennepo inp	SPEED (rpm)	BUSS VOLTAGE (volts) 2.83
	COURSE  DATA INPUT BY USER		LAF ND. (#)			FUKWARD VELDCITY (mph) 6.00	-168	HORSEPOWER GENERATED (hp) 995.06		ü	7	

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	ELECTRIC DRIVE TYPE HOPO1 P-G		RANGE ESTIMATE (miles) 52.19		NET DRIVE	EFF ICIENCY (%) 66.41		FUEL ECONOMY (mpg) 0.15			WER 5	D POWER (K.w) 15.0
	ENGINE SCHEDULING 		AVG. FORWARD VELOCITY (mph) 5.85		<u>;</u> ()	1UKUUE (ft-1b) 18330.20		FUEL REMAINING (gal.) 345.09		OUTER SPROCKET MOTOR	HORSEPOWER (hp) 339.75	FIEL
	SCHE			* * *	CKET	SFEED (rpm) 94.43	J.	4ED		ER SPROC	TORQUE (ft-1b) 755.88	CURRENT (amps) 81326.19
米米市	ENGINE  AD-1000	* * *	CUMMULATIVE TIME (sec) 349.61		OUTER SPROCKET	HOKSEPOWER (hp) 329.55	* * * -	FUEL CONSUMED (gal.) 1.270	茅木茅木	ITOO	SPEED (rpm) 2360.66	VOLTAGE (volts) 3.54
PARAMETERS 	VEHICLE	SE DATA	CUMMULATIVE DISTANCE (ft) 3000	MANCE DATA		TUKUUE HUK (ft-1b) 18330.20	RGY DATA	FUEL CONSUMPTION (1b/hr) 396.36	VE DATA	TOR	HORSEPOWER (hp) 339.75	FIELD POWER (Kw) 15.0
	MAX. LAT. ACCEL. (g's) 0.50	COURSE	TIME (sec) 90.91	PERFORMANCE	SPROCKET	SPEED (rpm) 94.43 1	/ ENERGY	ENGINE SPEED (rpm) 3200.00	C DRIVE	INNER SPROCKET MOTOR	TORQUE HC (+t-1b) 755.88	CURRENT F (amps) 81326.19
NOISSIM	MAX. VELOCITY (mph) 45.00	MISSION	RADE RADIUS (%) (ft) 38.8 0	VEHICLE F	INNER	HORSEPOWER (hp) 329.55	ENGINE	SEGMENT ENERGY LOSS (btu) 21417.14	ELECTRIC	INNER	SPEED T (rpm) (2350.65	VOLTAGE C (volts) (
***	SURFACE  COMPACTED SOIL	***	DISTANCE GRADE (ft) (%) 1000 38.8	* * *	LATERAL	ACCELERATION (g's) 0.000	****	CUMMULATIVE ENERGY USED (btu) 246106.20	****		GENERALOR POWER (Kw) S75.95	BUSS CURRENT (amps) 162652.40
			SEGMENT NO. (#) a		TRACTIVE	EFFORT (K-1bs) 32.95		SEGMENT ENERGY (btu) 63769.32			SPEED (rpm) 10400.00	BUSS VOLTAGE (valts) 3.54
	COURSE  DATA INPUT BY USER		LAP NO. S (#) 1		FORWARD	VELDCITY (mph) 7.50	169	HORSEPOWER GENERATED (hp) 992.41		I t	10 01	

	E		G. FORWARD VELOCITY (mph) 6.41		NET DRIVE TORQUE EFFICIENCY	(TC-10) 15527.92		FUEL FUEL REMAINING ECONOMY (gal.) (mpg) 344.03 0.18		40TOR	HORSEPOWER (hp) 345.37	FIELD POWER (Kw) 15.0
	ENGINE SCHEDULING  CONSTANT		AVG. VEL	***	SPROCKET SPEED 76					OUTER SPROCKET MOTOR	TORQUE (ft-1b) 640.33	CURRENT (amps) 68307.50
* * *	ENGINE  AD-1000	* *	CUMMULATIVE TIME (sec) 425.37	1	OUTER SPRC  HORSEPOWER	335.01	* * *	FUEL CONSUMED (gal.) 1.068	***	OUTE	SPEED (rpm) 2832.79	VOLTAGE (volts) 4.25
PARAMETERS 	VEHICLE	SE DATA	CUMMULATIVE DISTANCE (ft) 4000	MANCE DATA	TORQUE HOR!		SGY DATA	FUEL CONSUMPTION (1b/hr) 399.83	/E DATA	OR	HORSEPOWER (hp) 345.37	FIELD POWER (Kw) 15.0
-	MAX. LAT. ACCEL. (g's) 0.50	A COURSE	TIME (sec) 75.76	PERFORMANCE 	SPROCKET SPEED	~	/ ENERGY	ENGINE SPEED (rpm) 3200.00	C DRIVE	SPROCKET MOTOR	TORQUE HO (ft-1b) 640.33	CURRENT F (amps) 68307.50
NOISSIM *	MAX. VELOCITY (mph) 45.00	NOISSIW	GRADE RADIUS (%) (+t) 31.3 0	VEHICLE F	INNER SI  HORSEPOWER (hb.)	885.01	ENGINE	SEGMENT ENERGY LOSS (btu) 17651.26	ELECTRIC	INNER	SPEED TC (rpm) (4	VOLTAGE CL (volts) (⊲ 4.25 683
* * *	SURFACE  COMPACTED SOIL	* * *	DISTANCE (6+1)	***	LATERAL ACCELERATION	000.0	* * * *	CUMMULATIVE ENERGY USED (btu) 299634.90	***		CKW) (KW) 580.50	BUSS CURRENT (amps) 136615.00
			SEGMENT NO. (#) 4		TRACTIVE EFFORT (K-1he)	27.91		SEGMENT ENERGY (btu) 53528,72		ACT CATINE	SPEED (rpm)	BUSS VOLTAGE (volts) 4.25
	COURSE DATA INPUT BY USER		LAP NO. S (#)		FORWARD VELOCITY (mob)	00. 6 B-1	.70	HORSEPOWER GENERATED (hp) 999.65		ũ	o o	-

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FIELD FOWER

CURRENT

**VOLTAGE** 

FIELD POWER

15.0 3 Y

58406.58 CURRENT

(valts) 4.96 VOL.TAGE

(amps) 116813.20 CURRENT

BUSS

VOL.TABE (valts)

BUSS

(amps)

15.0 (<u>₩</u>

58406.58

(volts) 4.96

(ampa)

# 本本本本 ELECTRIC DRIVL PERFORMANCE \*\*\*

	ELECTRIC DRIVE TYPE 		RANGE ESTIMATE (miles) 82.85		NET DRIVE EFFICIENCY (%) 68.21		FUEL ECONOMY (mpg) 0.24			œ	HE.	
	ENGINE SCHEDULING I		G. FORWARD VELOCITY (mph) 7.48		TORQUE (ft-1b) 11843.66		FUEL REMAINING (gal.) 342.31		SPROCKET MOTOR	 HORSEPOWER (hp) 351.23	FIELD POWER (KW)	
	SCHE		A	*	CKET  SPEED (rpm) 151.08				3 SPROCKE	TORQUE (ft-1b) 488.40	CURRENT (amps) 51190.62	
***	ENGINE  AD-1000	* * *	CUMMULATIVE TIME (sec) 547.12	DATA ****	OUTER SPROCKET	* * * *	FUEL CONSUMED (gal.) 0.800	***	OUTER	SPEED (rpm) 3777.05	VOLTAGE (volts) 5.67	
PARAMETERS 	VEHICLE	SE DATA	CUMMULATIVE DISTANCE (ft) 6000	-	TORGUE HOR (+t-1b) 11843.66	SGY DATA	FUEL CONSUMPTION (1b/hr) 399.49	'E DATA	<b>.</b>	HORSEPOWER (hp) 351.23	FIELD FOWER (Kw) 15.0	
	MAX. LAT. ACCEL. (g's) 0.50	COURSE	TIME (sec) 56.82	PERFORMANCE	SPRDCKET SPEED (rpm) 151.08 1	ENERGY	ENGINE SPEED (rpm) 3200.00	DRIVE	INNER SPROCKET MOTOR	^0		
NOISSIM	MAX. VELOCITY (mph) 45.00	MISSION	RADIUS (ft)		INNER SPEC	ENGINE /	SEGMENT ENEKGY LOSS (btu) 12752.66	ELECTRIC	INNER SPR	SPEED TORQUE (rpm) (ft-1b) 3777.05 488.40	VOLTAGE CURRENT (volts) (amps) 5.67 51190.62	
**		İ	GRADE (%) 22.1	VEH]		İ	VE ED	1		γ)	3	
*	SURFACE  COMFACTED SOIL	* * *	DISTANCE (ft) 1000	***	LATERAL ACCELERATION (g´s) 0.000	* * *	CUMMULATIVE ENERGY USED (btu) 385531.00	* * *	. ACTORATOR.	POWER (KW) 580.05	BUSS CURRENT (amps) 102381.20	
			SEGMENT NO. (#) 6		TRACTIVE EFFORT (K-1bs) 21.29		SEGMENT ENERGY (btu) 40117.60		GENERATOR	SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 5.67	
	COURSE  DATA INPUT BY USER		LAP NO. (#)		FORWARD VELOCITY (mph) 12.00	72	HORSEPOWER GENERATED (hp) 998.93		39	0		

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	ELECTRIC DRIVE TYPE 		RANGE ESTIMATE (miles) 103.79		<u> </u>	NEI DKIVE (X) 69.39		FUEL ECONOMY (mpg) 0.30				
	ELECT DRIVE				} 1 2	7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		EC .			OWER )	FIELD POWER (KW) 15.0
	ENGINE SCHEDULING  CONSTANT		AVG. FORWARD VELOCITY (mph) 8.49			TORQUE (ft-1b) 9621.06		FUEL REMAINING (gal.) 340.97		SPROCKET MOTOR	HORSEPOWER (hp)	
	SCHE			***	SPROCKET	SPEED (rpm) 188.85	J.	الالالالالالالالالالالالالالالالالالال		ER SPROCK	TORQUE (ft-1b) 396.74	CURRENT (amps) 40870.45
* * *	ENGINE  AD-1000	***	CUMMULATIVE TIME (sec) 643.08	1	OUTER SFRO	HORSEPOWER (hp) 345.95	* * * *	FUEL CONSUMED (gal.) 0.639	* * *	OUTER	SPEED (rpm) 4721.31	VOLTAGE (volts) 7.08
PARAMETERS	VEHICLE 	E DATA	CUMMULATIVE DISTANCE (ft) BOOO	ANCE DATA		TORQUE HOR( (ft-1b) 9621.06 3	SY DATA	FUEL CONSUMPTION (1b/hr) 398.60	E DATA		 HORSEPOWER (hp) 356.65	FIELD POWER (Kw) 15.0
1	MAX. LAT. ACCEL. (9's) 0.50	COURSE	C TIME (sec) 45.45	PERFORMANCE	SPROCKET	SPEED TO (+ (+ (+ (+ (+ (+ (+ (+ (+ (+ (+ (+ (+	/ ENERGY	ENGINE SPEED (rpm) 3200.00	DRIVE	SPROCKET MOTOR	TORQUE HORG (ft-1b) (	CURRENT FIE (amps) 40870.45
MISSION	MAX. VELOCITY (mph) 45.00	18810N	RADIUS (ft) O	ICLE PI	INNER SPF	 HORSEPOWER (hp) 345.95	NGINE	SEGMENT ENERGY LOSS (btu) 9805.11	LECTRIC	INNER SE	SPEED TOF (rpm) (+1	VOLTAGE CUR (volts) (ar 7.08 4081
* * *		Σ !	GRADE (%)	日 と と に と に に に に に に に に に に に に に に に			Ш	Ä С	Ш		4	<u> </u>
*	SURFACE  COMPACTED SOIL	***	DISTANCE (ft) 1000	***		LATERAL ACCELERATION (g's) 0.000	* * *	CUMMULATIVE ENERGY USED (btu) 453143.20	* * *		GENERATOR POWER (KW) 578.89	BUSS CURRENT (amps) 81740.88
			SEGMENT NO. (#) 8			TRACTIVE EFFORT (K-1bs) 17.29		SEGMENT ENERGY (btu) 32034.69			GENERATOR SPEED (rpm) 10400.00	FUSS VOLTAGE (valts) 7.08
	COURSE  DATA INPUT BY USER		LAP NO. (#)			FORWARD VELOCITY (mph) 15.00		HORSEPOWER GENERATED (hp) 997.08			<u> </u>	•
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	ELECTRIC DRIVE TYPE 		RANGE ESTIMATE (miles) 114.02			NE! DRIVE EFFICIENCY (%) 69.49		FUEL ECONOMY (mpg) 0.33			WER 2	oower ™)
	ENGINE SCHEDULING		G. FORWARD VELOCITY (mph) 8.97			TORQUE (ft-1b) 8767.86		FUEL REMAINING (gal.) 340.38		ET MOTOR	HORSEPOWER (hp) 357.52	FIELD POWER (KW) 15.0
	SCHED		Ą	**	SPROCKET	SPEED (rpm) 207.74				OUTER SPROCKET MOTOR	TORQUE (ft-1b) 341.56	CURRENT (amps) 37199.34
* * * *	ENGINE  AD-1000	* * *	CUMMULATIVE TIME (sec) 684.41	1	OUTER SPRO	HORSEPOWER (hp) 346.80	字 字 字 ——	FUEL CONSUMED (gal.) 0.581	* * * *	OUTE	SPEED (rpm) 5193.44	VOLTAGE (volts) 7.79
PARAMETERS	VEHICLE	SE DATA	CUMMULATIVE DISTANCE (ft) 9000	IANCE DATA		TORQUE HOR( (ft-1b) 8767.86 34	36Y DATA	FUEL CONSUMPTION (1b/hr) 399.13	VE DATA	OR	HORSEPOWER (hp) 357.52	FIELD POWER (Kw) 15.0
- 1	MAX, LAT. ACCEL. (g's) 0.50	A COURSE	TIME (sec) 41.32	PERFORMANCE	SPROCKET	SPEED 207.74 (	/ ENERGY	ENGINE SPEED (rpm) 3200.00	IC DRIVE	SPROCKET MOTOR	TORQUE HO (ft-1b) 361.56	CURRENT F (amps) 37199.34
MISSIM	MAX. VELOCITY (mph) 45.00	MOISSIM	DE RADIUS (ft) .8 0	VEHICLE F	INNER	HORSEPOWER (hp) 346.80	ENGINE	SEGMENT ENERGY LOSS (btu) 8896.30	ELECTRIC	INNER	SPEED 1 (rpm) (5193.44	VOLTAGE C (volts) (7.79 37
* * *	SURFACE  COMFACTED SOIL	* * * *	DISTANCE GRADE (ft) (%) 1000 14.8	U)****		LATERAL ACCELERATION (g's) 0.000	* * * *	CUMMULATIVE ENERGY USED (btu) 482297.70	* * * *	7.00	GENERATUR POWER (Kw) 579.58	BUSS CURRENT (amps) 74398.68
			SEGMENT NO. (#) 9		!	TRACTIVE EFFORT (K-1bs) 15.76		SEGMENT ENERGY (btu) 29154.57			GENERALUR SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 7.79
	COURSE  DATA INPUT BY USER		LAP NO. S: (#)			FORWARD VELOCITY (mph) ED 16.50	175	HORSEPOWER GENERATED (hp) 998.18		į	GE 10	

PARAMETERS ****	MAX. LAT. ACCEL. (9's) 0.50 40 TON	COURSE DATA ****	CUMMULATIVE CUMMULATIVE DISTANCE TIME ) (+t) (sec)	PERFORMANCE DATA	OUTER SPROCKET	ENERGY DATA	ENGINE FUEL SPEED CONSUMPTION (rpm) (1b/hr) 200.00 399.16	DRIVE DATA ****	MOTOR	HORSEPOWER SPEED (rpm) (rpm) 357.55 55465.57	FIELD POWER VOLTAGE (KW) (volts) 15.0 8.50
NOISSIM	MAX. MAX. VELOCITY ACCE (mph) (g's 45.00 0.50	MISSION COL	GRADE RADIUS TIME (%) (ft) (sec) 13.1 0 37.88	VEHICLE PERF	INNER SPROCKET	ENGINE / EP	SEGMENT ENGINE ENERGY LOSS SPEED (btu) (rpm) 8155.44 3200.00	ELECTRIC DE	INNER SPROCKET MOTOR	SPEED TORQUE (rpm) (ft-1b) 5665.57 331.46	VOLTAGE CURRENT (volts) (amps) 8.50 34102.13
* * * *	SURFACE 	***	DISTANCE GF (ft) 1000 ·	> * * * *	LATERAL ACCELERATION (g's) 0.000	***	CUMMULATIVE ENERGY USED (btu) 509024.70	* * * *		DENERHIUK FOWER (Kw) 579.62	BUSS CURRENT (amps) 68204.25
			SEGMENT NO. (#) 10		TRACTIVE EFFORT (K-1bs) 14.45		SEGMENT ENERGY (btu) 26727.01		ָם בּיַרְאַם מָרָאָרָם בּיַרָּאָרָם בּיַרָּאָרָם בּיַרָּאָרָם בּיַרָּאָרָם בּיַרָּאָרָם בּיַרָּאָרָם בּיַרָּאָ	SPEED (rpm)	BUSS VOLTAGE (volts) B.50
	COURSE  DATA INPUT BY USER		LAP NO. (#)		FORWARD VELOCITY (mph) 18.00	-176	HORSEPOWER GENERATED (hp) 998.26		ŭ.	10 11 O1	

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	ENGINE ELECTRIC SCHEDULING DRIVE TYPE		AVG. FORWARD RANGE VELOCITY ESTIMATE (mph) (miles) 10.37 145.51		1100 F314	TORQUE EFFICIENCY (ft-1b) 67.47		FUEL FUEL REMAINING ECONOMY (gal.) (mpg) 338.90 0.42		:T MOTOR	HORSEFOWER (hp) 336.64	FIELD FOWER (Kw) 15.0
* -	1		IVE	***	OUTER SPROCKET	SPEED (rpm) 264.39	***	FUEL CONSUMED (gal.) 0.456	*	OUTER SPROCKET MOTOR	TORQUE (ft-1b)	CURRENT (amps) 29156.13
****	CLE ENGINE	* * * !		DATA	OUTER	HORSEPOWER (hp) 345.94	DATA **		****		SPEED (rpm) 6609.84	VOLTAGE (volts) 9.91
FARAMETERS 	VEHICLE	RSE DATA	CUMMULATIVE DISTANCE (ft) 12000	PERFORMANCE		TORQUE (ft-1b) 6872.08	ENERGY DA	E FUEL CONSUMPTION (1b/hr) 0 398.04	DRIVE DATA	otok	 HORSEPOWER (hp) 356.64	FIELD POWER (Kw) 15.0
1	MAX. LAT. Y ACCEL. (g's) 0.50	ON COURSE	US TIME ) (sec) 32.47	PERFOR	R SPROCKET	SPEED (rpm) 264.39		ENGINE SS SPEED (rpm) 3200.00	1	ER SPROCKET MOTOR	TORQUE (ft-1b) 283,38	CURRENT (amps) 29156.13
MOISSION *	MAX. VELOCITY (mph) 45.00	NOISSIW	GRADE RADIUS (%) (ft) 10.4 0	VEHICLE	INNER	HORSEPOWER (hp) 345.94	ENGINE	SEGMENT ENERGY LOSS (btu) 6977.07	ELECTRIC	INNER	SPEED (rpm) 6609.84	VOLTAGE (volts) 9.91
* * * .	SURFACE 	* * *	DISTANCE G (ft) 1000	* * *	1	ACCELERATION (g's)	* * * *	CUMMULATIVE ENERGY USED (btu) 556529.30	***		GENERATION FOWER (Kw)	BUSS CURRENT (amps) 58312.26
			SEGMENT NO. (#) 12		TRACTIVE	EFFORT (K-1bs) 12.35		SEGMENT ENERGY (btu) 22855.12		. 00	SPEED (rpm)	BUSS VOLTAGE (volts) 9.91
	COURSE DATA INPUT BY USER		LAP NO. (#)		FORMARD	VELDCITY (mph) 21.00	78	HORSEPOWER GENERATED (hp) 995.92		מ	10 11	

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	ELECTRIC DRIVE TYPE		RANGE ESTIMATE (miles) 155.44		2011 A 123 M A 221 M	NEI DAIVE EFFICIENCY (%) 69.49		FUEL ECONOMY (mpg) 0.44			ИЕR 7	D POWER (Kw) 15.0
	ENGINE SCHEDULING 		AVG. FORWARD VELOCITY (mph) 10.81			TORQUE (ft-1b) 6431.04		FUEL REMAINING (gal.) 338.48		KET MOTOR	HORSEPOWER (hp) 357.59	FIEL
	SCHE			***	SPROCKET	SPEED (rpm) 283.28	Ţ	L MED .) 26		ER SPROCKET	TORQUE (ft-1b) 265.20	CURRENT (amps) 27284.90
* * *	ENGINE  AD-1000	**	CUMMULATIVE TIME (sec) 820.02	1	OUTER SPR	HORSEPOWER (hp) 346.87	* * *	FUEL CONSUMED (gal.) 0.426	子 子 子 子 子	OUTER	SPEED (rpm) 7081.97	VOLTAGE (volts) 10.62
PARAMETERS 	VEHICLE 40 TON	SE DATA	CUMMULATIVE DISTANCE (ft) 13000	ANCE DATA		TORQUE HOR (ft-1b) 6431.04	SGY DATA	FUEL CONSUMPTION (1b/hr) 399.22	JE DATA	.OR	HORSEPOWER (hp) 357.59	FIELD FOWER (Kw) 15.0
1	MAX. LAT ACCEL. (g's) o.50	COURSE	TIME (sec) 30.30	PERFORMANCE	SPROCKET	SPEED (rpm) 283.28	/ ENERGY	ENGINE SPEED (rpm) 3200.00	C DRIVE	INNER SPROCKET MOTOR	TORQUE HC (4t-1b) 265.20	CURRENT (amps) 27284.90
MISSION	MAX. VELOCITY (mph) 45.00	NOISSIM	RADE RADIUS (%) (ft) 9.38 0	VEHICLE F	INNER SI	HORSEPOWER (hp) 346.87	ENGINE	SEGMENT ENEKGY LOSS (btu) 6524.92	ELECTRIC	INNER	SPEED T (rpm) (	VOLTAGE C (volts) ( 10.62 27
* * *	SURFACE 	* * *	DISTANCE GRADE (ft) (%) 1000 9.38	***		LATERAL ACCELERATION (g's) 0.000	* * *	CUMMULATIVE ENERGY USED (btu) 577913.30	* * *		GENEKATUK POWER (Kw) 579.69	BUSS CURRENT (amps) 54569.79
			SEGMENT NO. (#) 13			TRACTIVE EFFORT (K-1bs) 11.56		SEGMENT ENERGY (btw) 21383,92			GENERAIOR SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 10.62
	COURSE  DATA INPUT BY USER		LAP NO. S (#)			FORWARD VELDCITY (mph) 22.50	B <b>-</b> 179	HORSEPOWER GENERATED (hp) 998.37 ·			GE 11C	·

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	ELECTRIC DRIVE TYPE 		RANGE ESTIMATE (miles) 165.81			NEI DKIVE EFFICIENCY (%) 69.49	·	FUEL ECONOMY (mpg) 0.47			~	JER
	ENGINE B SCHEDULING DI		G. FORWARD VELOCITY (mph) 11.26			TOKQUE (ft-1b) 6028,78		FUEL REMAINING (gal.) 338.08		T MOTOR	HORSEPOWER (hp) 357.58	FIELD FOWER (KW) 15.0
	SCHED		₹	* * *	SPROCKET	SPEED (rpm) 302.16				R SPROCKET MOTOR	TORQUE (ft-1b) 248.61	CURRENT (amps) 25578.27
* * *	ENGINE  AD-1000	***	CUMMULATIVE TIME (sec) 848.43	1	OUTER SPRO	HORSEROWER (hp) 346.85	* * * *	FUEL CONSUMED (gal.) 0.400	* * *	OUTER	SPEED (rpm) 7554.10	VOLTAGE (volts) 11.33
PARAMETERS	VEHICLE  40 TON	E DATA	CUMMULATIVE DISTANCE (ft) 14000	ANCE DATA		TORQUE HORS (ft-1b) 6028.78 34	СУ ВАТА	FUEL CONSUMPTION (16/hr) 399.19	E DATA	ūς	 HORSEPOWER (hp) 357.58	FIELD POWER (Kw) 15.0
	MAX. LAT. ACCEL. (g's) 0.50	I COURSE	TIME (sec) 28.41	PERFORMANCE	SPROCKET	SPEED T (rpm) (	/ ENERGY	ENGINE SPEED (rpm) 3200.00	C DRIVE	SPROCKET MOTOR	TORQUE HOR (ft-1b) 248.61 3	CURRENT FI (amps) 25578.27
MISSION	MAX. VELOCITY (mph) 45.00	MISSION	DE RADIUS ) (ft) 45 0	ICLE	INNER SE	HORSEPOWER (hp) 346.85	ENGINE	SEGMENT ENEKGY LOSS (btu) 6116.87	ELECTRIC	INNER	SPEED TC (rpm) (4	VOLTAGE CU (volts) (a 11.33 255
* * *	SURFACE  COMPACTED SOIL	***	DISTANCE GRADE (41) (%) 1000 8.45	工山〇 ****		LATERAL ACCELERATION (g's) 0.000	* * *	CUMMULATIVE ENERGY USED (btu) 597959.70	***		SENERATUR POWER (Kw) 579.66	BUSS CURRENT (amps) 51156.53
			SEGMENT ND. (#) 14			TRACTIVE EFFORT (K-1bs) 10.84		SEGMENT ENERGY (btu) 20046.46			SPEED SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 11.33
	COURSE  DATA INPUT BY USER		LAP NO. S (#)			FORWARD VELOCITY (mph) 24.00	B-180	HORSEPOWER GENERATED (hp) 998.32		į	H 01	

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	ELECTRIC DRIVE TYPE 		/ RANGE ESTIMATE (miles) 175.86		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	NEI DKIVE EFFICIENCY (%) 69.50		FUEL ECONOMY (mpg) 0.50			DWER 15	FIELD POWER (Kw) 15.0
	ENGINE SCHEDULING 		AVG. FORWARD VELOCITY (mph) 11.69			TORQUE (ft-1b) 5683.37		FUEL REMAINING (gal.) 337.70		KET MOTOR	HORSEPOWER (hp) 7 358.14	
	SCHE			***	SPROCKET	SPEED (rpm) 321.05		1ED		ER SPROCKET	TORQUE (ft-1b) 234.37	CURRENT (amps) 24112.79
***	ENGINE  AD-1000	* * *	CUMMULATIVE TIME (sec) 875.17		OUTER SPRO	HORSEPOWER (hp) 347.41	* * *	FUEL CONSUMED (gal.) 0.377	* * *	OUTER	SPEED (rpm) 8026.23	VOLTAGE (volts) 12.04
PARAMETERS 	VEHICLE	SE DATA	CUMMULATIVE DISTANCE (ft) 15000	MANCE DATA		TORQUE HOR( (ft-1b) 5683.37 3	RGY DATA	FUEL CONSUMPTION (16/hr) 399.91	VE DATA	rok	HORSEPOWER (hp) 358.16	FIELD POWER (Kw) 15.0
	MAX. LAT. ACCEL. (g's) 0.50	COURSE	TIME (sec) 26.74	PERFORMANCE	SPROCKET	SPEED (rpm) 321.05	/ ENERGY	ENGINE SPEED (rpm) 3200.00	C DRIVE	SPROCKET MOTOR	TORQUE HC (+t-1b) 234.37	CURRENT (amps) 24112.79
MISSION	MAX. VELOCITY (mph) 45.00	MISSION	E RADIUS (ft) 5 0		INNER S	HORSEPOWER (hp) 347.41	ENGINE	SEGMENT ENERGY LOSS (btu) 5764.06	ELECTRIC	INNER	SPEED T (rpm) ( 8026.23	VOLTAGE C (valts) ( 12.04 24
****	SURFACE  COMPACTED SOIL	* * * *	DISTANCE GRADE (4t) (%) 1000 7.65	*************************************		LATERAL ACCELERATION (g's) 0.000	* * *	CUMMULATIVE ENERGY USED (btu) 616855.30	***		GENERATUR POWER (Kw) 580.60	BUSS CURRENT (amps) 48225.57
			SEGMENT ND. (#) 15			TRACTIVE EFFORT (K-1bs) 10.22		SEGMENT ENERGY (btu) 18895.57			GENERATOR SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 12.04
	COURSE  DATA INPUT BY USER		LAP NO. S (#) 1			FORWARD VELOCITY (mph)  8 25.50	181	HORSEPOWER GENERATED (hp) 999.82		•	. GE	,
											. •	5 5. S. S. S.

	SCHEDULING DRIVE TYPE CONSTANT HOPOI P-G		AVG. FORWARD RANGE VELOCITY ESTIMATE (mph) (miles) 12.12		NET DRIVE TORQUE EFFICIENCY (+t-1b) (%) 5351.01 69.48		FUEL FUEL REMAINING ECONOMY (gal.) (mpg) 337.35		SPROCKET MOTOR	HORSEPOWER (hp) 357.05	FIELD POWER (KW)
* * * *	ENGINE SCHE)	***	CUMMULATIVE AVU TIME ( (sec) 900.42	* * *	OUTER SPROCKET	* * *	FUEL CONSUMED (gal.) 0.355	***	OUTER SPROCKE	SPEED TOROUE (rpm) (ft-1b) 8498.36 220.66	VOLTAGE CURRENT (volts) (amps)
PARAMETERS *	VEHICLE 	DATA	CUMMULATIVE CU DISTANCE (ft)	NCE DATA	OUTER  TORQUE HORSEPOWER (ft-1b) (hp) 5351.01 346.34	DATA	FUEL CONSUMPTION (1b/hr) 398.54	DATA		HORSEPOWER SI (hp) (1	FIELD FOWER VOL.
- 1	MAX. LAT. ACCEL. (g's) 0.50	ON COURSE	TIME (sec) 25.25	FERFORMANCE	INNER SPROCKET	= / ENERGY	ENGINE SPEED (rpm) 3200.00	RIC DRIVE	INNER SPROCKET MOTOR	TORQUE HORS (ft-1b) ( 220.66 35	CURRENT FIE
NOISSION **	MAX. VELOCITY (mph) 45.00	NOISSIM +	GRADE RADIUS (%) (ft) 6.88 0	VEHICLE	INNEF HORSEFOWER (hp) 346.34	FNGINE	SEGMENT ENERGY LOSS (btu) 5431.21	* ELECTRIC	INNI	SPEED (rpm) 8498.36	VOLTAGE (volts)
* * *	SURFACE 	***	DISTANCE (ft) 1000	***	LATERAL ACCELERATION (g's) 0.000	* * *	CUMMULATIVE ENERGY USED (btu) 634650.10	***		GENERATOR POWER (Kw) 578.81	BUSS CURRENT (amps)
	USER		SEGMENT NO. (#) 16		TRACTIVE EFFORT (K-1bs)		ER SEGMENT D ENERGY (btu) 17794.81			GENERATOR SPEED (rpm) 10400.00	BUSS VOLTAGE (volts)
	COURSE  DATA INPUT BY		LAP NG. (#) 1		FORWARD VELOCITY (mph) 8 27.00	-182	HORSEPOWER GENERATED (hp) 996.99				

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	ELECTRIC DRIVE TYPE 		RANGE ESTIMATE (miles) 196.75			NET DRIVE EFFICIENCY (%) 69.49	-	FUEL ECONOMY (mpg) 0.56			sr'	WER	
	ENGINE ELE SCHEDULING DRIV		AVG. FORWARD VELOCITY (mph) 12.55			TORQUE (ft-1b) 5080.51		FUEL REMAINING (gal.) 337.01		т моток	HORSEPOWER (hp) 357.83	FIELD POWER (Kw) 15.0	
	ENG SCHED			**	SPROCKET	SPEED (rpm) 358.82				ER SPROCKET	TORQUE (ft-1b) 209.51	CURRENT (amps) 21555.02	,
* * *	ENGINE  AD-1000	**	CUMMULATIVE TIME (sec) 924.34	1	OUTER SPRC	HORSEPOWER (hp) 347.10	* * *	FUEL CONSUMED (gal.) 0.337	***	OUTER	SPEED (rpm) 8970.49	VOLTAGE (volts) 13.46	
PARAMETERS	VEHICLE 	E DATA	CUMMULATIVE DISTANCE (ft)	ANCE DATA		TORQUE HOR: (ft-1b) 5080.51 3	GY DATA	FUEL CONSUMPTION (1b/hr) 399.51	E DATA	K	HORSEPOWER (hp) 357.83	FIELD FOWER (Kw) 15.0	
ON PARA	MAX. LAT. ACCEL. (9's) 0.50	A COURSE	TIME (sec) 23.92	PERFORMANCE	SPROCKET	SPEED (rpm)	/ ENERGY	ENGINE SPEED (rpm) 3200.00	IC DRIVE	SPROCKET MOTOR	TORQUE HOI (ft-1b) 209,51	CURRENT F (amps) 21555.02	
MISSIM	MAX. VELOCITY (mph) 45.00	MISSIM	RADE RADIUS (%) (ft) 6.25 0	VEHICLE	INNER	HORSEPOWER (hp) 347.10	ENGINE	SEGMENT ENERGY LOSS (btu) 5153.81	ELECTRIC	INNER	SPEED (rpm) 8970.49	VOLTAGE (volts) 13.46 2	
* * * *	SURFACE 	* * *	DISTANCE GRADE (ft) (%) 1000 6.25	** **		LATERAL ACCELERATION (g's) 0.000	***	CUMMULATIVE ENERGY USED (btu) 651542.50	* * *		GENERALOK POWER (Kw) 580.08	BUSS CURRENT (amps) 43110.04	
			SEGMENT ND. (#) 17			TRACTIVE EFFORT (K-1bs) 9.13		SEGMENT ENERGY (btu) 16892.40			GENERATUR SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 13.46	
	COURSE  DATA INPUT BY USER		LAP ND. S (#)			FORWARD VELOCITY (mph) 28.50	83	HORSEPOWER GENERATED (hp) 998.98			95 10		

# \*\*\* ELECTRIC DRIK PERFORMANCE \*\*\*

	ELECTRIC DRIVE TYPE 		RANGE ESTIMATE (miles) 207.25			NET DRIVE EFFICIENCY (%) 69.49		FUEL ECONOMY (mpg) 0.59				ĸ
	0N   T		AVB. FORWARD VELOCITY (mph) 12.96			N TORQUE E (ft—1b) 4823.40		FUEL REMAINING (gal.) 336.69		T MOTOR	HORSEPOWER (hp) 357.60	FIELD POWER (KW) 15.0
	ENGINE SCHEDULI  CONSTAN			***	SPROCKET	SPEED (rpm)				OUTER SPROCKET MOTOR	TORQUE (ft-1b) 198.90	CURRENT (amps) 20464.20
* * *	ENGINE  AD-1000	***	CUMMULATIVE TIME (sec) 947.07	** - T	OUTER SPRC	 HORSEPOWER (hp) 346.88	* * * +	FUEL CONSUMED (gal.) 0.320	* *	OUTE	SPEED (rpm) 9442.63	VOLTAGE (volts) 14.16
PARAMETERS	VEHICLE	SE DATA	CUMMULATIVE DISTANCE (ft) 18000	1		TORQUE HOR (ft-1b) 4823.40 3	GY DATA	FUEL CONSUMPTION (1b/hr) 399.23	E DATA	ኧ	HORSEPOWER (hp) 357.60	FIELD FOWER (Kw) 15.0
1	MAX. LAT ACCEL. (g's) 0.50	COURSE	TIME (sec) 22.73	PERFORMANCE 	SPROCKET	SPEED (rpm)	/ ENERGY	ENGINE SPEED (rpm)	DRIVE	ROCKET MOTOR	TORQUE HOR (ft-1b)	CURRENT FI (amps) 20464.20
MISSIM	MAX. VELDCITY (mph) 45.00	MISSION	RADIUS (ft) O	CLE	INNER SPE	HORSEPOWER (hp) 346.88	ENGINE	SEGMENT ENEKGY LOSS (btu) 4893.78	ELECTRIC	INNER SPROCKET	SPEED TOF (rpm) (ft 9442.63 15	VOLTAGE CUR (volts) (am 14.16 2046
*		1	GRADE (%) 5.65	く 日日 日 日 日 日		Ĭ	1					30
* * * *	SURFACE  COMPACTED SOIL	***	DISTANCE (ft) 1000	* * *		LATERAL ACCELERATION (g's) 0.000	* * *	CUMMULATIVE ENERGY USED (btu) 667580.80	*	CENERATOR	POWER (KW) 579.71	BUSS CURRENT (amps) 40928.39
			SEGMENT NO. (#) 18			TRACTIVE EFFORT (K-1bs) 8.67		SEGMENT ENERGY (btu) 16038.31			SPEED (rpm)	FUSS VOLTAGE (volts) 14.16
	COURSE  DATA INPUT BY USER		LAP NO. (#)			- CELOCITY (mph) 8-184		HORSEPOWER GENERATED (hp) 998.39		u	2, 01	

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	ELECTRIC DRIVE TYPE 		RANGE ESTIMATE (miles) 217.88		<u>i</u>	NEI DKIVE EFFICIENCY (%) 69.48		FUEL ECONOMY (mpg) 0.62			ĸ	WER J
	ENGINE DE SCHEDULING DE CONSTANT H		AVG. FORWARD VELOCITY (mph) 13.38			TORQUE (ft-1b) 4588.63		FUEL REMAINING (gal.) 336.39		SPROCKET MOTOR	HORSEPOWER (hp) 357.21	FIELD POWER (Kw) 15.0
	ENG SCHED CONS			*	CKET	SPEED (rpm) 396.59					TORQUE (ft-1b) 189.22	CURRENT (amps) 19468.13
* * * *	ENGINE  AD-1000	**	CUMMULATIVE TIME (sec) 968.72	****	OUTER SPROCKET	HORSEFOWER (hp)	* * * *	FUEL CONSUMED (gal.)	***	OUTER	SPEED (rpm) 9914.77	VOLTAGE (volts) 14.87
PARAMETERS	VEHICLE 	SE DATA	CUMMULATIVE DISTANCE (ft) 19000	TANCE DATA		TORQUE HORS (ft-1b) (4588.63 34	GY DATA	FUEL CONSUMPTION (1b/hr) 398,74	ZE DATA	.OR	HORSEPOWER (hp) 357.21	FIELD POWER (Kw) 15.0
	MAX. LAT. ACCEL. (g's) 0.50	COURSE	TIME (sec) 21.64	PERFORMANCE	SPROCKET	SPEED (rpm) 396.59	/ ENERGY	ENGINE SPEED (rpm) 3200.00	C DRIVE	SPROCKET MOTOR	TORQUE HC (ft-1b) 189.22	CURRENT F (amps)
NOISSIM	MAX. VELOCITY (mph) 45.00	MOISSIM	GRADE RADIUS (%) (ft) 5.1 0	VEHICLE F	INNER S	 HORSEFOWER (hp) 346.49	ENGINE	SEGMENT ENERGY LOSS (btu) 4656.88	ELECTRIC	INNER	SPEED T (rpm) (9914.77	VOLTAGE C (volts) ( 14.87 15
***	SURFACE  COMFACTED SOIL	***	DISTANCE GF (ft)	> * * * * *		LATERAL ACCELERATION (g's) 0.000	* * * *	CUMMULATIVE ENERGY USED (btu) 682839.70	* * *		GENERATUR POWER (Kw) 579.07	BUSS CURRENT (amps) 38936.25
			SEGMENT NO. (#) 19			TRACTIVE EFFORT (K-1bs) 8.25		SEGMENT ENERGY (btu) 15258,97			GENERATOR SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 14.87
	COURSE  DATA INPUT BY USER		LAP NO. S (#)			FORWARD VELOCITY (mph) 31.50	B-185	HORSEPOWER GENERATED (hp) 997.37			6F 1C	

	ELECTRIC DRIVE TYPE 		RANGE ESTIMATE (miles) 227.71			NET DRIVE EFFICIENCY (%) 69.49		FUEL ECONOMY (mpg) o.65			ER	OWER O
	ENGINE SCHEDULING 		AVG. FORWARD VELOCITY (mph) 13.79			TORQUE (ft-1b) 4389.58		FUEL REMAINING (gal.) 336.09		OUTER SPROCKET MOTOR	HORSEPOWER (hp) 357,98	FIELD FOWER (Kw) 15.0
	SCHI			*	CKET	SPEED (rpm) 415.48		ED 1		SPROCK	TORQUE (ft-1b) 181.01	CURRENT (amps) 18623.63
* * *	ENGINE  AD-1000	***	CUMMULATIVE TIME (sec) 989.38	****	OUTER SPROCKET	HORSEPOWER (hp)	* * *	FUEL CONSUMED (gal.) 0.291	**	OUTE	SPEED (rpm) 10386.90	VOLTAGE (volts) 15.58
PARAMETERS 	VEHICLE	SE DATA	CUMMULATIVE DISTANCE (ft) 20000	MANCE DATA		TORQUE HOR( (ft-1b) 4389.58	36Y DATA	FUEL CONSUMPTION (1b/hr) 399.70	ZE DATA	OR	HORSEPOWER (hp) 357.98	FIELD POWER (Kw) 15.0
1	MAX. LAT ACCEL. (g's) 0.50	COURSE	TIME (sec) 20.66	PERFORMANCE	SPROCKET	SPEED (rpm) 415.48	/ ENERGY	ENGINE SPEED (rpm)	C DRIVE	SPROCKET MOTOR	TORQUE HO (ft-1b) 181.01	CURRENT F (amps) 18623.63
NOISSIM	MAX. VELOCITY (mph) 45.00	MISSION	E RADIUS (ft) 3 0	   C   E	INNER SP	HORSEPOWER (hp) 347.25	ENGINE	SEGMENT ENERGY LOSS (btu) 4452.44	ELECTRIC	INNER S	SPEED TO (+ (+ (+ (+ (+ (+ (+ (+ (+ (+ (+ (+ (+	VOLTAGE CU (volts) (a 15.58 186
* * *	SURFACE 	***	DISTANCE GRADE (#1) (%) 1000 4.63	I T Ш \ * * * *		LATERAL ACCELERATION (g's) 0.000	* * *	CUMMULATIVE ENERGY USED (btu) 697434.30	****		DENERHION FOWER (Kw) 580.33	BUSS CURRENT (amps) 37247.27
	USER		SEGMENT NO. (#) 20			TRACTIVE EFFORT (K-1bs) 7.89		SEGMENT ENERGY (btu) 14594.63		- COLLINE	SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 15.58
	COURSE  DATA INPUT BY	٠	LAP NO. (#)			FORWARD VELOCITY (mph) 33.00	-186	HORSEPOWER GENERATED (hp) 999.37		Ċ	16 OF	

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	ELECTRIC DRIVE TYPE HOPOI P-G		RANGE ESTIMATE (miles) 238,27		NET DRIVE EFFICIENCY (%) 69.49		FUEL ECONOMY (mpg) 0.68
	ENGINE SCHEDUL ING		AVG. FORWARD VELOCITY (mph) 14.19		 TORQUE (+t-1b)		FUEL REMAINING (gal.) 335.82
* * *	ENGINE S	***	CUMMULATIVE TIME (sec) 1009.14	* * * *	OUTER SPROCKET	· 不 · 不 · 不 · 不 · 不 · 不 · 不 · 不 · 不 · 不	FUEL CONSUMED (gal.) 0.278
PARAMETERS 	VEHICLE  40 TON	E DATA	CUMMULATIVE DISTANCE (ft) 21000	ANCE DATA	TORQUE HORS! (ft-1b) (1 4195.27 34	GY DATA	FUEL CONSUMPTION (1b/hr) 399.33
- 1	MAX. LAT. ACCEL. (g's) 0.50	COURSE	TIME (sec) 19.76	FERFORMANCE	9	/ ENERGY	ENGINE SPEED (rpm) 3200.00
NOISSIM	MAX. VELOCITY (mph) 45.00	NOISSIW	E RADIUS (ft) 7 0	CCE	INNER SPROCKET	ENGINE	SEGMENT ENERGY LOSS (btu) 4256.23
* * *	SURFACE  COMPACTED SOIL	i * * *	DISTANCE GRADE (ft) (%) 1000 4.17	[工田2 ****	LATERAL ACCELERATION (g's) 0.000	****	CUMMULATIVE ENEKGY USED (btu) 711383.80
			SEGMENT NO. (#) 21		TRACTIVE EFFORT (K-1bs) 7.54		SEGMENT ENERGY (btu) 13949.47
	COURSE  DATA INPUT BY USER		LAP NO. (#)		FORWARD VELOCITY (mph) 8 34.50	-187	HORSEPOWER GENERATED (hp) 998.61

FIELD FOWER

(ΧΣ 10.0

CURRENT (amps) 17799.25

VOLTAGE (volts) 16.29

FIELD POWER

(₹£ 10.0

CURRENT (amps) 17799.25

VOLTAGE (volts) 16.29

BUSS CURRENT (amps) 35598.49

BUSS VOLTAGE (volts)

16.29

HORSEPOWER

OUTER SPROCKET MOTOR

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ELECTRIC

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357.59 (hp)

TORQUE (ft-1b) 173.00

(rpm) 10859.04

SPEED

HORSEPOWER

INNER SPROCKET MOTOR

(hp) 357.69

TORQUE (ft-1b) 173.00

SPEED (rpm) 10859.04

(¥ ₹

GENERATOR POWER 579.85

GENERATOR SPEED

(rpm) 10400,00

	ELECTRIC DRIVE TYPE 		RANGE ESTIMATE (miles) 248,73			NET DRIVE EFFICIENCY (%) 69,49		FUEL ECONOMY (mpg) 0.71			ER	OWER O
	ENGINE SCHEDULING 		AVG. FORWARD VELOCITY (mph) 14.60			TORQUE (ft-1b) 4019.05		FUEL REMAINING (gal.) 335.55		SPROCKET MOTOR	HORSEPOWER (hp) 3 357,56	FIELD POWER (KW)
	9 8CH 			*	CKET	SPEED (rpm) 453.25		ED 7			TORQUE (ft-1b) 165.73	CURRENT (amps) 17051.60
* * *	ENGINE  AD-1000	* * * *	CUMMULATIVE TIME (sec) 1028.08	DATA ***	OUTER SPROCKET	HORSEPOWER (hp) 346.84	***	FUEL CONSUMED (gal.) 0.267	***	OUTER	SPEED (rpm) 11331.17	VOLTAGE (volts) 17.00
PARAMETERS	VEHICLE	SE DATA	CUMMULATIVE DISTANCE (ft) 22000	- 1		TORQUE HOR (ft-1b) 4019.05 3	SGY DATA	FUEL CONSUMPTION (1b/hr) 399.18	ZE DATA	OR	 HORSEPOWER (hp) 357.56	FIELD POWER (Kw) 15.0
1	MAX. LAT. ACCEL. (g's) 0.50	A COURSE	TIME (sec) 18.94	PERFORMANCE 	SPROCKET	SPEED (rpm) 453.25	/ ENERGY	ENGINE SPEED (rpm) 3200.00	C DRIVE	INNER SPROCKET MOTOR	токаие но (ft-1b) 165.73	CURRENT F (amps) 17051.60
NOISSIM	MAX. VELGCITY (mph) 45.00	MISSIM	)E RABIUS (ft) 75 0	VEHICLE F	INNER S	 HORSEFOWER (hp) 346.84	ENGINE	SEGMENT ENERGY LOSS (btu) 4077.81	ELECTRIC	INNER	SPEED T (rpm) (	VOLTAGE CI (volts) ( 17.00 17
***	SURFACE 	***	DISTANCE GRADE (%) (%) 1000 3.75	U > * * * * ·		LATERAL ACCELERATION (g's) 0.000	***	CUMMULATIVE ENERGY USED (btu) 724747.60	***	1 1 1 1 1 1 1	CENERHIOR FOWER (Kw) S79.64	BUSS CURRENT (amps) 34103.20
			SEGMENT NO. (#) 22			TRACTIVE EFFORT (K-1bs) 7.22		SEGMENT ENERGY (btu) 13363.89		< 0 < 0 1 - 1 - 1 - 1	SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 17.00
	COURSE  DATA INPUT BY USER		. LAP NO. 6 (#)			FORWARD VELOCITY (mph) 8 36.00	188	HORSEPOWER GENERATED (hp) 998.29		Ĺ	10 11	

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	ELECTRIC DRIVE TYPE		RANGE ESTIMATE (miles) 258.57		1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	NEI DAIVE EFFICIENCY (%) 69.50		FUEL ECONOMY (mpg) 0.74			WER 22
	ENGINE SCHEDULING		AVG. FORWARD VELOCITY (mph) 15.00			TORQUE (ft-1b)		FUEL REMAINING (gal.) 335.29		OUTER SPROCKET MOTOR	JE HORSEPOWER (hp) (hp)
***	ENGINE SC 	***	CUMMULATIVE TIME (sec) 1046.26	***	OUTER SPROCKET	HORSEPOWER SPEED (rpm) (rpm) 347.48 472.13	***	FUEL CONSUMED (gal.) 0.256	***	OUTER SPR(	SPEED TORQUE (rpm) (ft-1b) 11803.30 159.40
PARAMETERS 	VEHICLE 	E DATA	CUMMULATIVE DISTANCE (ft) 23000	ANCE DATA		TORQUE HORSE (ft-1b) (4 345.40 34.	GY DATA	FUEL CONSUMPTION (1b/hr) 399.99	E DATA	DR	 HORSEPOWER (hp) 358.22
1	MAX. LAT. ACCEL. (g's) 0.50	N COURSE	TIME (sec) 18.18	PERFORMANCE	SPROCKET	SPEED (rpm) 472.13	/ ENERGY	ENGINE SPEED (rpm)	IC DRIVE	INNER SPROCKET MOTOR	TORQUE HO (ft-1b) 159,40
NOISSIM	MAX. VELOCITY (mph) 45.00	MISSION	GRADE RADIUS (%) (ft) 3.38 0	VEHICLE	INNER	HORSEPOWER (hp) 347.48	ENGINE	SEGMENT ENERGY LOSS (btu) 3920.10	ELECTRIC	INNE	SPEED (rpm) 11803.30
* * *	SURFACE  COMPACTED SOIL	***	DISTANCE GR (ft) ( 1000 3	> ****		LATERAL ACCELERATION (g's) 0.000	* * *	CUMMULATIVE ENERGY USED (btu) 737598.80	***		GENERATOR POWER (KW) 580.71
			SEGMENT NO. (#) 23		:	TRACTIVE EFFORT (K-1bs) 6.95		SEGMENT ENEKGY (btu) 12851.15			GENERATOR SPEED (rpm) 10400.00
	COURSE  DATA INPUT BY USER		LAP NO. (#)			FORWARD VELOCITY (mph) 37.50	-189	HORSEPOWER GENERATED (hp) 999.99			9 1

FIELD POWER (Kw)

CURRENT (amps) 16399.69

VOLTAGE (volts) 17.70

FIELD POWER (Kw) 15.0

CURRENT (amps) 16399.69

VOLTAGE (volts) 17.70

BUSS CURRENT (amps) 32799.37

BUSS VOLTAGE (volts) 17.70

	ELECTRIC DRIVE TYPE 		RANGE ESTIMATE (miles) 269.64		<u>.</u>	NEI DKIVE EFFICIENCY (%) 69.48		FUEL ECONOMY (mpg) 0.77			~	JER
	SCHEDUL ING D		G. FORWARD VELOCITY (mph) 15.39			TORQUE (ft-1b) 3707.67		FUEL REMAINING (gal.) 335.05		SPROCKET MOTOR	HORSEPOWER (hp) 357.35	FIELD POWER (KW) 15.0
	SCHEI		₹	*	XET	SPEED (rpm) 491.02				SPROCKE	TORQUE (ft-1b) 152.89	CURRENT (amps) 15730.50
* * *	ENGINE  AD-1000	**	CUMMULATIVE TIME (sec) 1063.74	HT ***	OUTER SPROCKET	HORSEPOWER. 5 (hp) ( 346.63 4	***	FUEL CONSUMED (gal.) 0.246	***	outer	SPEED (rpm) 12275.43	VOLTAGE (valts) 18.41
PARAMETERS	VEHICLE 	SE DATA	CUMMULATIVE DISTANCE (ft) 24000	ANCE DATA		TORQUE HOR( (ft-1b) 3707.67 3	GY DATA	FUEL CONSUMPTION (1b/hr) 398.91	E DATA	JR.	HORSEPOWER (hp) 357.35	FIELD FOWER (Kw) 15.0
	MAX. LAT. ACCEL. (g's) 0.50	COURSE	TIME (sec) 17.48	PERFORMANCE	SPROCKET	SPEED (rpm) 491.02	/ ENERGY	ENGINE SPEED (rpm) 3200.00	DRIVE	SPROCKET MOTOR	TORQUE HOF (ft-1b)	CURRENT F: (amps) 15730.50
MISSIM	MAX. VELOCITY (mph) 45.00	MISSION	E RADIUS (ft) O	VEHICLE PE	INNER SPA	HORSEPOWER (hp) 346.63	ENGINE	SEGMENT ENERGY LOSS (btu) 3762.44	ELECTRIC	INNER SF	SPEED TOR (rpm) (ft 12275.43 15	VOLTAGE CUR (volts) (am 18.41 1573
* * *	SURFACE  COMFACTED SOIL	***	DISTANCE GRADE (ft) (%) 1000 3	山 ・ ・ ・ ・ ・ ・ ・ ・ ・ ・ ・ ・ ・		ACCELERATION (g's) 0.000	***	CUMMULATIVE ENERGY USED (btu) 749927.80	***	001111111111111111111111111111111111111		BUSS CURRENT (amps) 31461.01
			SEGMENT NO. (#) 24		Fi i i i i i i i i i i i i i i i i i i	KAC!IVE EFFORT (K-1bs) 6.66		SEGMENT ENEKGY (btu) 12329.07		00.1	SPEED (rpm)	EUSS VOLTAGE (volts) 18.41
	COURSE  DATA INPUT BY USER		LAP NO. (#)		מטלייטטנו	CELOCITY (mph)  8 39.00	90	HORSEPOWER GENERATED (hp) 997.74		Ü	10	

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	ELECTRIC DRIVE TYPE		RANGE ESTIMATE (miles) 279.82		Li i i i i i i i i i i i i i i i i i i	NEI DKIVE EFFICIENCY (%) 69.49		FUEL ECONOMY (mpg) 0.80			~	JER
			AVG. FORWARD VELOCITY (mph) 15.78			TORQUE (ft-1b) 3572.56		FUEL REMAINING (gal.) 334.81		MOTOR	HORSEPOWER (hp) 357.57	FIELD POWER (Kw) 15.0
	ENGINE SCHEDULING 			*	CKET	SPEED (rpm) 509.90				OUTER SPROCKET MOTOR	TORQUE (ft-1b) 147.32	CURRENT (amps) 15157.25
* * *	ENGINE  AD-1000	***	CUMMULATIVE TIME (sec) 1080.58	****	OUTER SPROCKET	HORSEFOWER (hp) 346.84	* * * *	FUEL CONSUMED (gal.) 0.237	* * *	OUTE	SPEED (rpm) 12747.56	VOLTAGE (volts) 19.12
PARAMETERS	VEHICLE	E DATA	CUMMULATIVE DISTANCE (ft) 25000	ANCE DATA		TORQUE HORS (+t-1b) ( 3572.56 34	GY DATA	FUEL CONSUMPTION (16/hr) 399.19	E DATA	Œ.	 HORSEPOWER (hp) 357.57	FIELD POWER (Kw) 15.0
	MAX. LAT. ACCEL. (g's) 0.50	A COURSE	TIME (sec) 16.83	PERFORMANCE	SPROCKET	SPEED T (rpm) (509.90	/ ENERGY	ENGINE SPEED (rpm)	IC DRIVE	SPROCKET MOTOR	TORQUE HOR (ft-1b)	CURRENT FI (amps) 15157.25
NOISSIM	MAX. VELOCITY (mph) 45.00	MISSIM	GRADE RADIUS (%) (ft) 2.67 0	VEHICLE	INNER	 HORSEPOWER (hp) 346.84	ENGINE	SEGMENT ENERGY LOSS (btu) 3624.77	ELECTRIC	INNER	SPEED (rpm) 12747.56	VOLTAGE ( (volts) 19.12 18
* * *	SURFACE  COMPACTED SOIL	***	DISTANCE GR( (ft) (7 1000 2.	***	į	LATERAL ACCELERATION (g's) 0.000	* * * *	CUMMULATIVE ENERGY USED (btu) 761807.00	***		GENEKATOK POWER (Kw) 579.65	BUSS CURRENT (amps) 30314.50
			SEGMENT NO. (#) 25		!	TRACTIVE EFFORT (K-1bs) 6.42		SEGMENT ENERGY (btu) 11879.21		1	GENERATOR SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 19.12
	COURSE  DATA INPUT BY USER		LAP NO. 9 (#)		·	FORWARD VELOCITY (mph) 40.50	B-191	HORSEPOWER GENERATED (hp) 998.30		, ,,		

	ELECTRIC RIVE TYPE 		RANGE ESTIMATE (miles) 289.60		NET DRIVE EFFICIENCY (%) 69.50		FUEL ECONDMY (mpg) 0.83					
	ΩΙΙ		ą.						OR	HORSEPOWER (hp) 358.21	FIELD POWER (Kw) 15.0	
	ENGINE SCHEDULING CONSTANT		AVG. FORWAN VELOCITY (mph) 16.17		 D TORQUE ) (+t-1b) 79 3451.18		FUEL REMAINING (gal.) 334.58		SPROCKET MOTOR	\ \ \		
*	Ы ! О О	*	ATIVE E c) 81	****	SPROCKET SPEED (rpm) 528,79	*	FUEL CONSUMED (gal.) 0.229	*	OUTER SPI	<b> -                                  </b>	CURRENT (amps) 14642.28	
* *	ENGINE  AD-1000	* * *	CUMMULATIVE TIME (sec) 1096.81	1	OUTER  HORSEFOWER (hp) 347.47	* * *		* * *	J	SPEED (rpm) 13219.69	VOLTAGE (valts) 19.83	
PARAMETERS 	VEHICLE	SE DATA	CUMMULATIVE DISTANCE (ft) 26000	ANCE DATA	TORQUE HOR (ft-1b) 3451.18	GY DATA	FUEL CONSUMPTION (1b/hr) 399.98	E DATA	76	 HORSEPOWER (hp) 358.21	FIELD FOWER (Kw) 15.0	
- 1	MAX. LAT ACCEL. (g's) 0.50	A COURSE	TIME (sec) 16.23	PERFORMANCE	SPKOCKET SPEED (rpm) 528.79	/ ENERGY	ENGINE SPEED (rpm) 3200.00	C DRIVE	INNER SPROCKET MOTOR	TORQUE HO (ft-1b) 142.32	CURRENT F (amps) 14642.28	
NOISSIM	MAX. VELOCITY (mph) 45.00	115810N	RADIUS (ft) O	ICLE	INNER  RSEFOWER (hp)	NGINE	SEGMENT ENERGY LOSS (btu) 3500.03	ELECTRIC	INNER	SPEED T (rpm) (	VOLTAGE CO (volts) (, 19.83 14,	
* * * * * * * * * * * * * * * * * * * *		Σ!	GRADE (%) 2.37	1日	₽	Ш ! *					3.5.	
*	SURFACE 	* * * *	DISTANCE (ft) 1000	* * * .	LATERAL ACCELERATION (g's) 0.000	* * * *	CUMMULATIVE ENERGY USED (btu) 773281.00	* * *	ÜÜL	POWER (Kw) 580.70	BUSS CURRENT (amps) 29284.57	
			SEGMENT NO. (#) 26		TRACTIVE EFFORT (K-1bs) 6.20		SEGMENT ENERGY (btu) 11474.03		0 	SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 19.83	
	COURSE DATA INPUT BY USER		LAF NO. (#)		FORWARD VELOCITY (mph) 42.00	192	HORSEPOWER GENERATED (hp) 999.97		ö	, , ,		
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	ELECTRIC DRIVE TYPE 		RANGE ESTIMATE (miles) 312.47		NET DRIVE EFFICIENCY (%) 69.46		FUEL ECONOMY (mpg) 0.89			œ.	WER
	ENGINE SCHEDULING I		AVG. FORWARD VELOCITY (mph) 16.94		TDRQUE (ft-1b) 3200.76		FUEL REMAINING (gal.) 334.15		SPROCKET MOTOR	HORSEPOWER (hp) 355.95	FIELD POWER (Kw) 15.0
	SCHEN			* * *	OCKET SPEED (rpm) 566.56	ů.	L .) 12		ER SPROCK	TORQUE (ft-1b) 131.99	CURRENT (amps) 13579.82
* * *	ENGINE	* * *	CUMMULATIVE TIME (sec) 1127.64	į	OUTER SPROCKET	* * *	FUEL CONSUMED (gal.) 0.212	* * *	OUTER	SPEED (rpm) 14163.94	VOLTAGE (volts) 21.25
PARAMETERS	VEHICLE 40 TON	SE DATA	CUMMULATIVE DISTANCE (ft) 28000	AANCE DATA	TORQUE HORS (ft-1b) 3200,76 34	RBY DATA	FUEL CONSUMPTION (1b/hr) 397.18	ZE DATA	OR	HORSEPOWER (hp) 355.95	FIELD POWER (Kw) 15.0
	MAX. LAT ACCEL. (g's) 0.50	I COURSE	TIME (sec) 15.15	PERFORMANCE	SPROCKET SPEED (rpm) 566.56	/ ENERGY	ENGINE SPEED (rpm) 3200.00	C DRIVE	SPROCKET MOTOR	TORQUE HO (ft-1b) 131.99	CURRENT F (amps) 13579.82
NOISSIM	MAX. VELOCITY (mph) 45.00	NOISSIW	GRADE RADIUS (%) (ft) 1.75 0	VEHICLE F	INNER SI  HORSEPOWER (hp) 345,27	ENGINE	SEGMENT ENERGY LOSS (btu) 3251.25	ELECTRIC	INNER	SPEED T( (rpm) (-	VOLTAGE CU (volts) ( 21.25 133
* * *	SURFACE 	***	DISTANCE G (ft) 1000	***	LATERAL ACCELERATION (g's) 0.000	* * *	CUMMULATIVE ENERGY USED (btu) 794986.30	***	( ) ( ) ( ) ( )	GENERATUR POWER (Kw) S77.03	BUSS CURRENT (amps) 27159.65
			SEGMENT NO. (#)		TRACTIVE EFFORT (K-1bs) 5.75		SEGMENT ENERGY (btu) 10646.64			GENERATUR SPEED (rpm) 10400.00	BUSS VOLTAGE (volts) 21.25
	COURSE  DATA INPUT BY USER		LAP NO. S (#)		FORWARD VELOCITY (mph) 45.00	B-19	HORSEPOWER BENERATED (hp) 994.13			10	

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### APPENDIX C

CONFIGURATION III ANALYSIS

ENGINEERING SHEET

Project: ELECTRIC DRIVE

Page \_\_\_ of \_\_\_

Title: CONFIGURATION II ANALYSIS

### 1. INTRODUCTION

FOR THE PURPOSE OF THIS ANALYSIS THE FINAL DRIVES ARE ASSUMED TO BE A CONVENTIONAL ARRANGEMENT OF SPUR REDUCTION GEARS COMBINED WITH A PLANETARY SECTION TO SUM THE PROPULSION AND STEER INPUTS.

THE APPROACH USED IS AS FOLLOWS :

- · BRIEF DISCUSSION OF CONFIGURATION III
- . GEAR AND POWER FLOW ANALYSIS
  - ASSUMPTIONS / BACKGROUND
  - ARRANGEMENT OF COMBINING PLANETARY
  - ARRANGEMENT #1

GEARING

POWER FLOW SCHEMATIC

- ARRANGEMENT # 2

GEARING

POWER FLOW SCHEMATIC

· RESULTS

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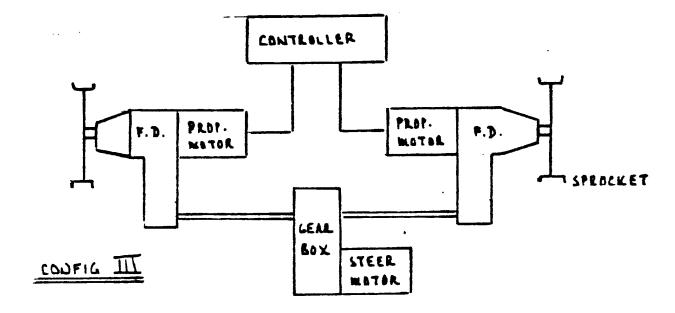
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2. DISCUSSION OF CONFIGURATION I

IN ORDER FOR CONFIGURATION II TO FUNCTION:

- a) BOTH PROPULSION MOTORS MUST OPERATE AT IDENTICAL SPEEDS AND THUS CONTROL THE AVERAGE VEHICLE SPEED.
- b) THE STEER MOTOR CONTROLS STEERING ONLY.
- c) THE FINAL DRIVES MUST HAVE SOME TYPE OF COMBINING PLANETARY.

A SKETCH OF THIS CONFIGURATION APPEARS BELOW:



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3, GEAR AND POWER FLOW ANALYSIS

THE FOLLOWING ANALYSIS IS TYPICAL FOR A PLANETARY GEAR SET BASED ON MATHEMATICAL PROCEDURES AND PLANETARY GEAR SET OPERATION.

a) ASSUMPTIONS / BACKGROUND :

SYMBOLS USED

T = TORQUE

W = ANGULAR VELOCITY

N = NO, OF TEETH

SUBSCRIPTS

S = SUN GEAR

I = INTERNAL GEAR

C = CAGE

SIGN CONVENTION

INPUT HP = + , OUTPUT HP = -

:INPUT SPEED AND TORQUE WILL HAVE THE SAME SIGN AND OUTPUT SPEED AND TORQUE WILL HAVE OPPOSITE SIGN. ZT = O . (PROOF@ P. C-10)

TORQUE RELATIONSHIP

$$T_S = -\frac{T_C}{1+M}$$
 WHERE  $M = \frac{N_S}{N_S}$ 

$$T_{\underline{x}} = -\frac{M}{1+M} T_{\underline{c}}$$
 .:  $T_{\underline{S}} + T_{\underline{r}} = -T_{\underline{c}}$ 

b) ARRANGEMENT OF COMBINING PLANETARY:

TWO ARRANGEMENTS WETRE ANALYZED AS FOLLOWS

	# <u>1</u>	± Z		
CAGE	OUTPU	T		
INTERNAL GEAR	PROP. MOTOR	STEER MOTOR		
SUN GEAR	STEER MOTOR	PROP. MOTOR		

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PROVIDE ANALYSIS OF THESE ARRANGEMENTS BACKGROUND FROM WHICH CONFIGURATION I FLOW ANALYSIS CAN BE DERIVED. ARRANGEMENT & POWER FLOW; IS ANALYZED FIRST FOR GEARING AND THEN ARRANGEMENT #2.

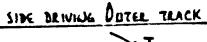
( INTERNAL = PROP. MOTOR, SUN = STEER MOTOR, d) ARRANGEMENT #1 CAGE = OUTPUT)

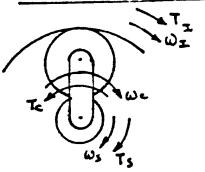
GEARING

SIDE DRIVING INVER TRACK









- · SINCE THE SUN GEARS ARE DRIVEN BY THE STEER MOTOR THEY MUST HAVE OPPOSING SPEEDS AS SHOWN ABOVE TO SLOW DOWN INNER TRACK AND SPEED UP OUTER TRACK.
- · BY DEFINITION (PAGE 3) AT THE INNER TRACK SIDE, To & WO ARE SAME SIGN (BECAUSE OF REGENERATIVE HP FLOWING INTO UNIT FROM TRACKS). AT OUTER TRACK SIDE, THE SIGNS OPPOSE BECAUSE HP IS FLOWING OUT OF UNIT.
- · FROM TORQUE RELATIONSHIP (PAGE 3), BOTH SUN TORQUE, TO & INTERNAL GEAR TORQUE, TI MUST BE OF OPPOSITE SIGN FROM CAGE TORQUE, To, SHOWN ABOVE.
- . THE SIGNS OF SPEED, W; TORQUE, T & ; HP WILL THEN BE :

	INNER	2 TRACK		OUTER TRACK			
	<del>-</del>	N	ے	I	S	ے	
•	PROP	STEER MOTOR	OUTPUT	PROP	STEER	OUTPUT	
W	+	-	+	+	+	+	
T	_	-	+	+	+	-	
HP	-	+	+	+	+	_	

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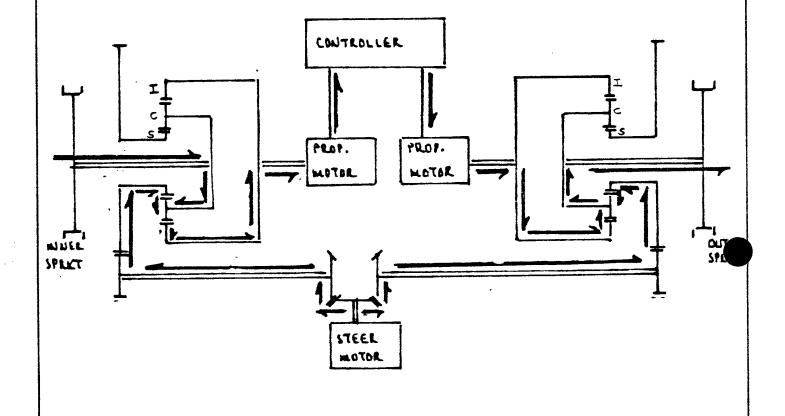
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POWER FLOW SCHEMATIC

REGENERATIVE HP FLOWS INTO THE PROPULSION MOTOR AND NOT THROUGH THE STEER CONTROL SHAFT.



FORWARD STEER DIRECTION

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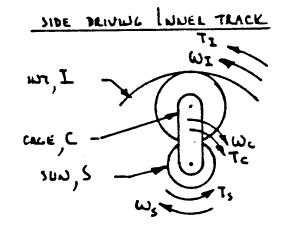
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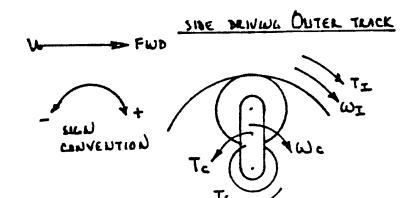
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e) ARRANGEMENT #2 (INTERNAL = STEER MOTOR, SUIN = PROP MOTOR,

CAGE = OUTPUT)

GEARING





- · SINCE THE INTERNAL GEARS ARE DRIVEN BY THE STEER MOTOR, THEY MUST HAVE OPPOSING SPEEDS AS SHOWN ABOVE.
- . THE SIGNS OF THE TORQUE WILL BE THE SAME AS FOR ARRANGEMENT #1.
- . THE SIGNS OF W, T, HP WILL THEN BE :

		INNER	TRAC	K	OUTER	TRAC	K
		I S C			エ	S	
		STEER MOTOR	PROP	OUTPUT	STEER	PROP MOTOR	OUTPUT
ſ	w w	-	+	+	+	+	+
Ī	T	-	-	+	+	+	<u>-</u>
	HP	+	-	+	+	+	

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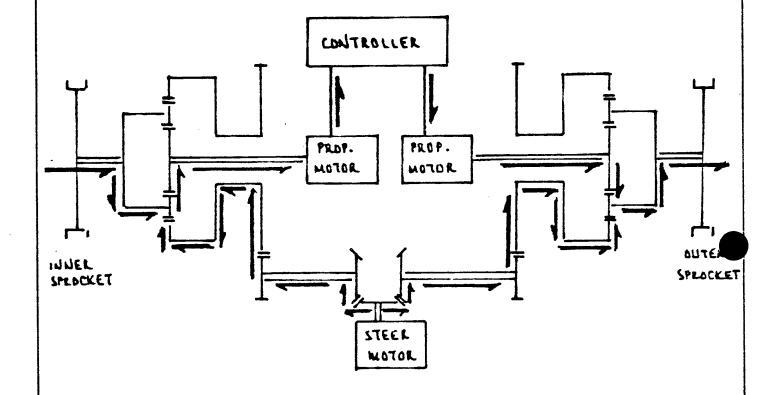
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Title:

POWER FLOW SCHEMATIC

REGENERATIVE HP FLOWS INTO THE PROPULSION MOTOR, AND NOT THROUGH THE STEER CONTROL SHAFT.



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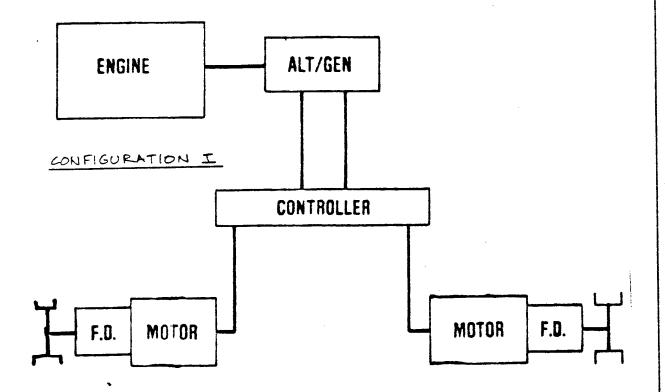
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4. RESULTS

- . IN BOTH ARRANGEMENTS, THE POWER FLOW
  IS INTO THE PROPULSION MOTOR (FROM STEERING
  REGENERATION)
- · BECAUSE REGENERATED POWER FLOW IS THRU INNER TRACK PROPULSION MOTOR, MOTOR TO CONTROLLER TO OUTER TRACK PROPULSION MOTOR, MOTORS AND CONTROLLER MUST BE SIZED TO TRANSFER REGENERATIVE LOADS. THIS IS THE SAME MANNER IN WHICH CONFIGURATION I OPERATES (SHOWN BELOW)



POWER EFFICIENTLY, BUT CONFIGURATION III HAS THE BURDEN OF CARRYING A STEER MOTOR AND SHAPTING TO ACCOMPLISH THE SAME TRANSFER THAT CONFIGURATION I CARRIES OUT. A SUMMARY OF THIS FACT IS ON THE NEXT PAGE.

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iguration III  ENGINE  CONTROLLER  STEER  MOTOR  Detailed analysis shows regenerative HP flow is through the propulsion motors  This arrangement has no advantage over  Configuration I	Title:		Page	9 of 9
	Configuration III		MOTOR STEER MOTOR	Detailed analysis shows regenerative HP flow is through the propulsion motors  This arrangement has no advantage over Configuration I
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### DISCUSSION

IN A COMBINION PLANETARY, WHEN WE APPLY THE SIGN CONVENTION FOR 119 ( LE + = INPUT , - = OUTPUT)
WE FIND THAT THE SUN ! INT TORK MUST HAVE THE SAME SENSE ( LE POSITIVE OR NEGATIVE SIGN)

WE WILL PROVE THE ABOVE PT . IN THE FOLLOWING ANALYSIS

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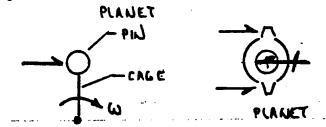
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- = APPLIED FORCE

- REACTION FORCE

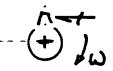
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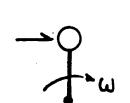
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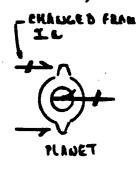
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(PLANCT TOWTH LOADS APPLY : REACTIVE)





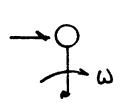
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IL CAGE = OUTPUT

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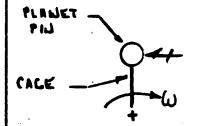
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( BOTH PLANET LOADS ARE REACTIVE )



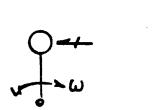


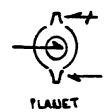
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### CONCLUSION

THERE ARE 6 POSSIBLE COMBINATIONS OF SUIN ! INT TORK AS SHOWN IN THE PRECEDING AWALYSIS. IN ALL 6 CASES, THE SIGN OF THE TORK ARE THE SAME (IE BOTH POSITIVE OF BOTH WEGATIVE)

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### APPENDIX D

CONFIGURATION IV ANALYSIS

Appendix D Configuration IV Analysis

The information in this appendix supplements the discussion in Section 5.2.6 in the main body of the report.

CVX 650 POWER

FLOW ANALYSIS .

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Page 1 of 3	

Title: XHM 650 TOUT & MP

### BISCUSSION

FROM ALLICON TABULATION OF SPAS ? PARTIAL TABLICATION OF TARICS, TOUT : HP WILL BE CALCULATED

### MATE

TOUT NOT TABLELATED IN ALLISON DATA HENCE DETERMINED BY

1 i lev : Tour:  $T_{52}(\frac{53}{56},\frac{132}{20})$ 

 $2 : T_{K}(\frac{132}{30})$ 

- (=) CALCUS FOR 300 NOT PERFORMED SINCE THERE IS AN GRACK IN 340 RANGE SPEEDS & PRESHINABLY IN TORK ALSO
- 131 108% LEAL EFF ASSUMED
- MAX MOTOR OUTPUT TORK OF 2437 IS FOR 100% PUMP - MOTOR TOLK EFFICIENCY

IN FACT BOTH TORK ! VOLUMETRIC EFF ARE ASSUMED TO DE 100% IN ALLISON TABLE SINCE MUMP HP = MOTOR HP

PUMP/MOTOR CIR = 35

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TK  $\left(\frac{132}{30}\right)$ 

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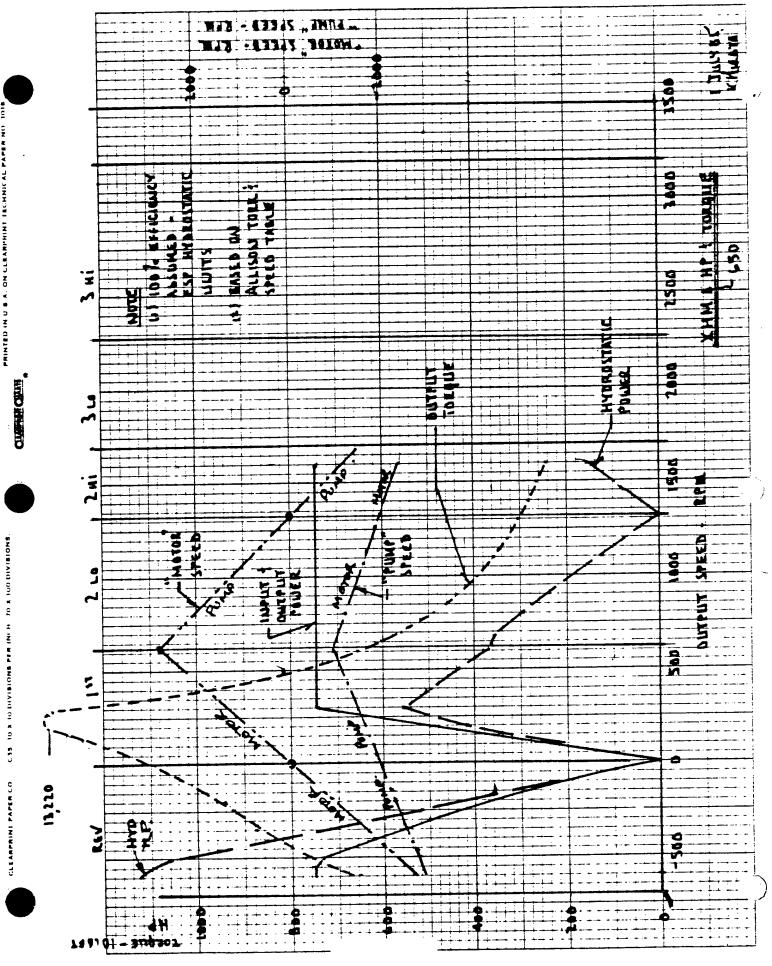
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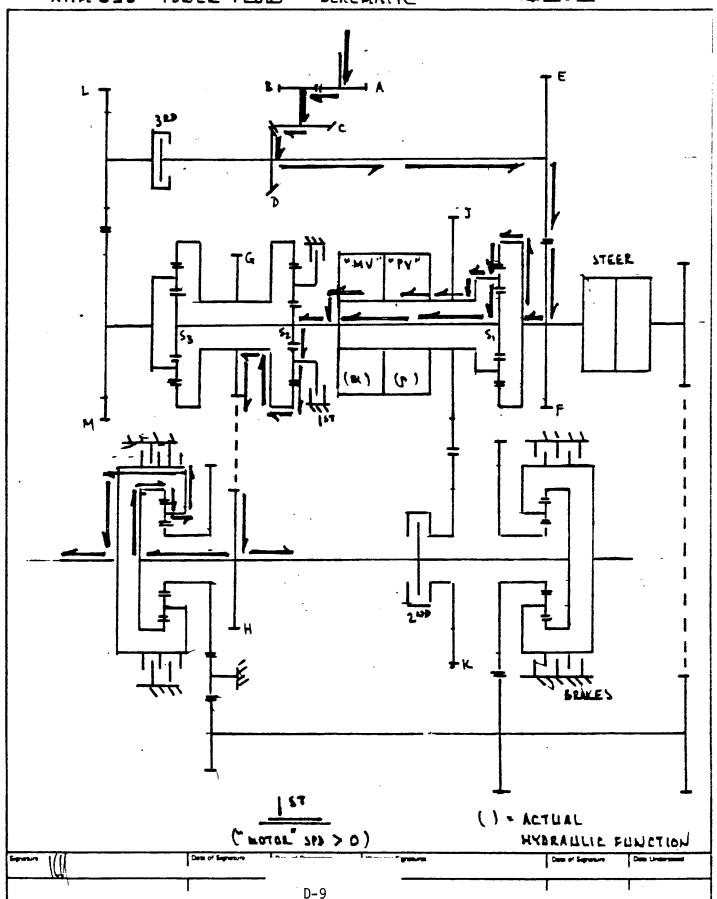
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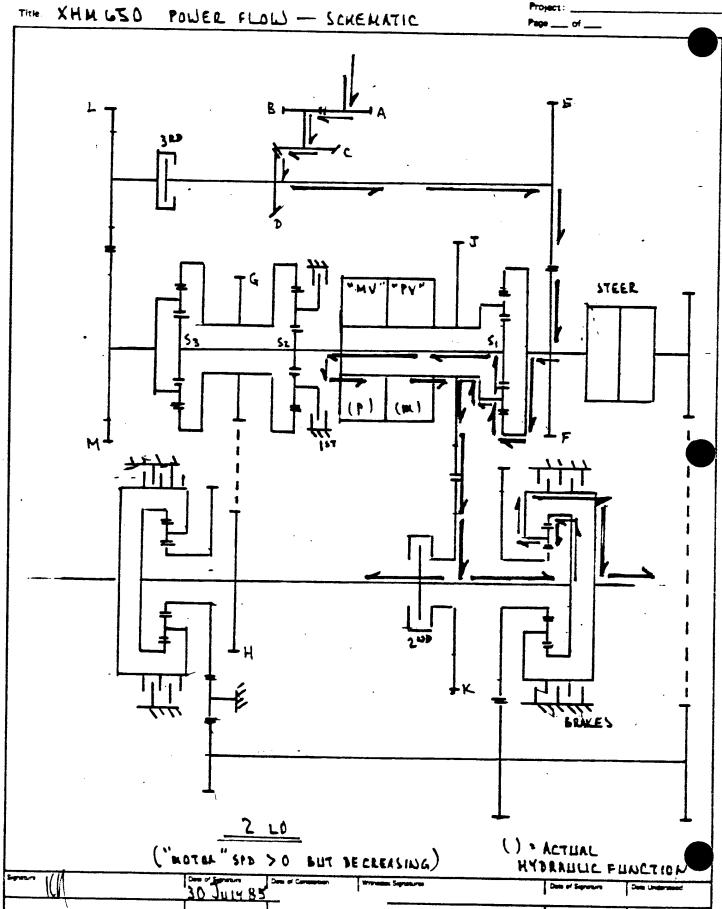
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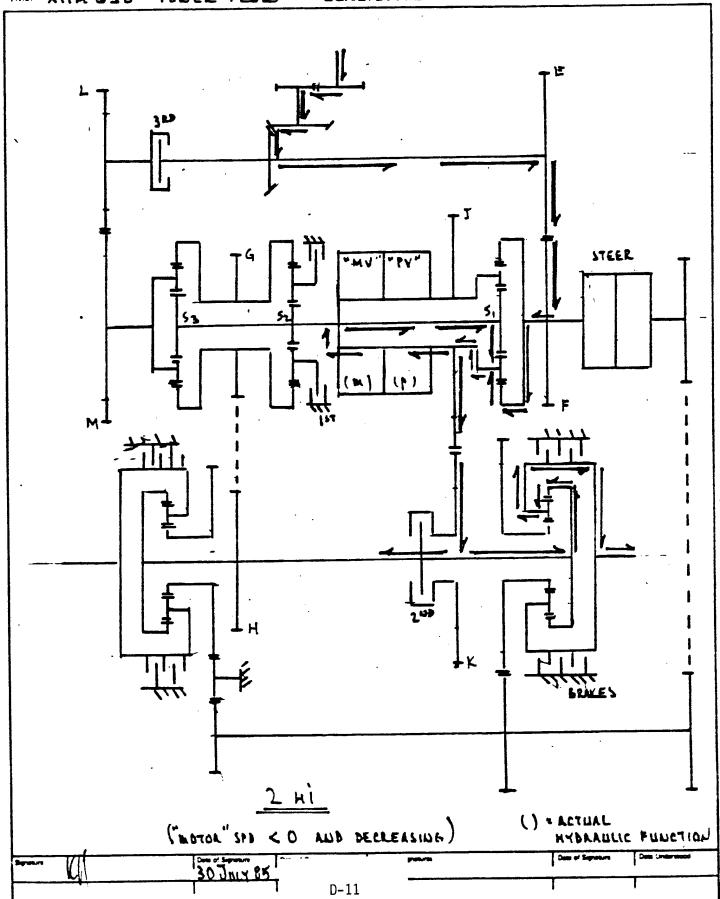


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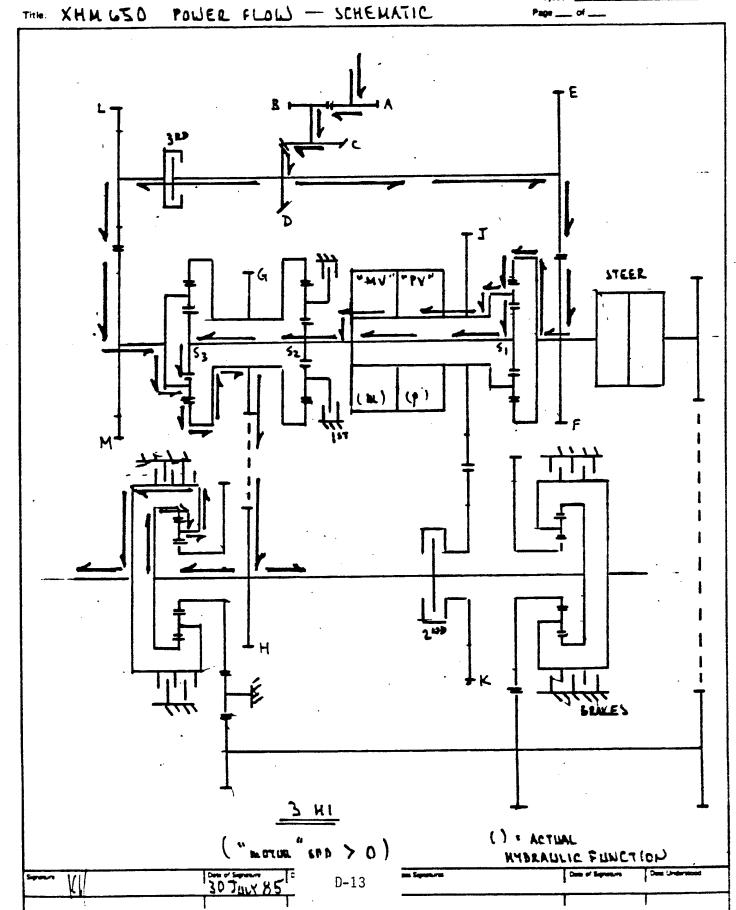


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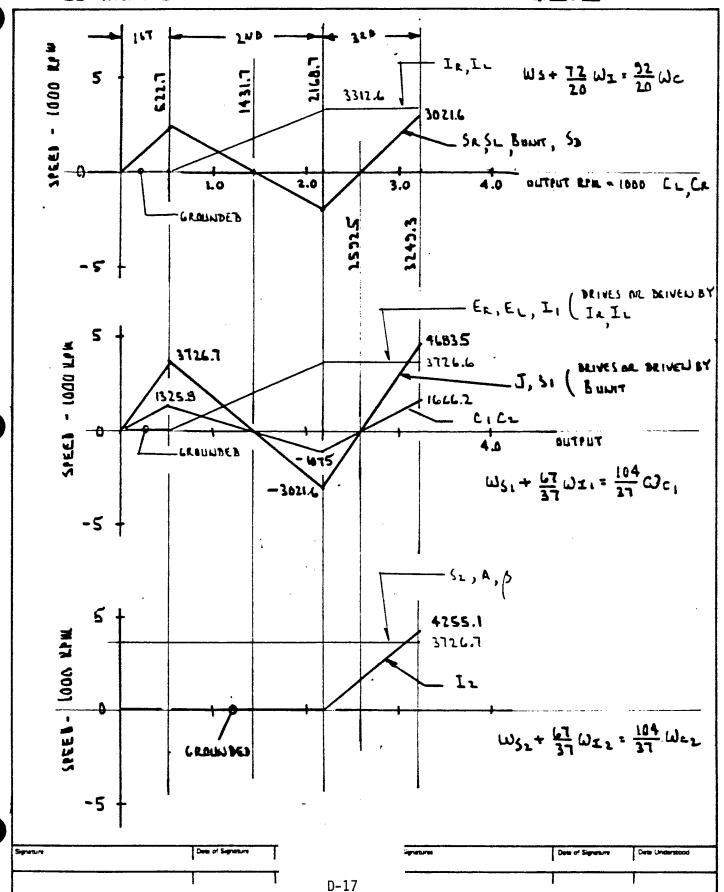
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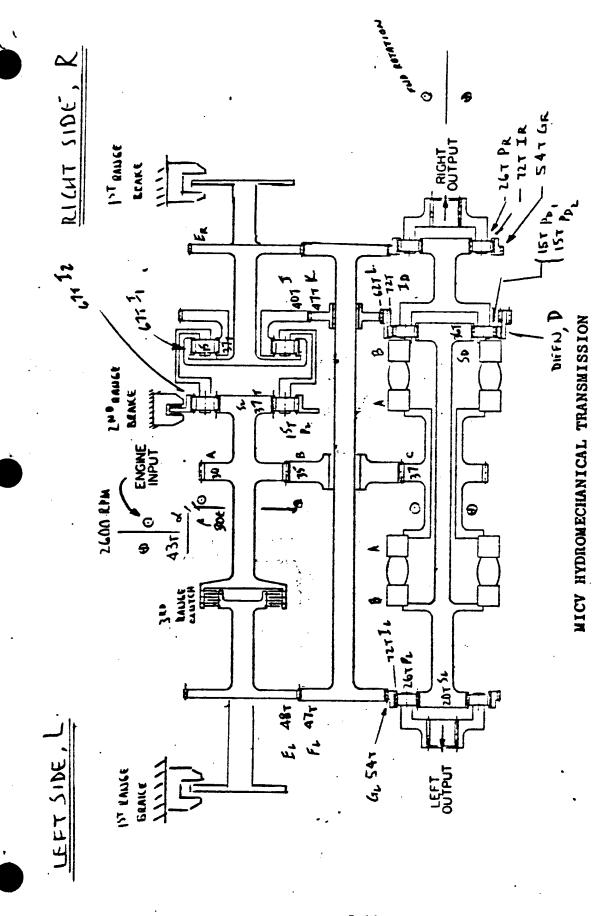
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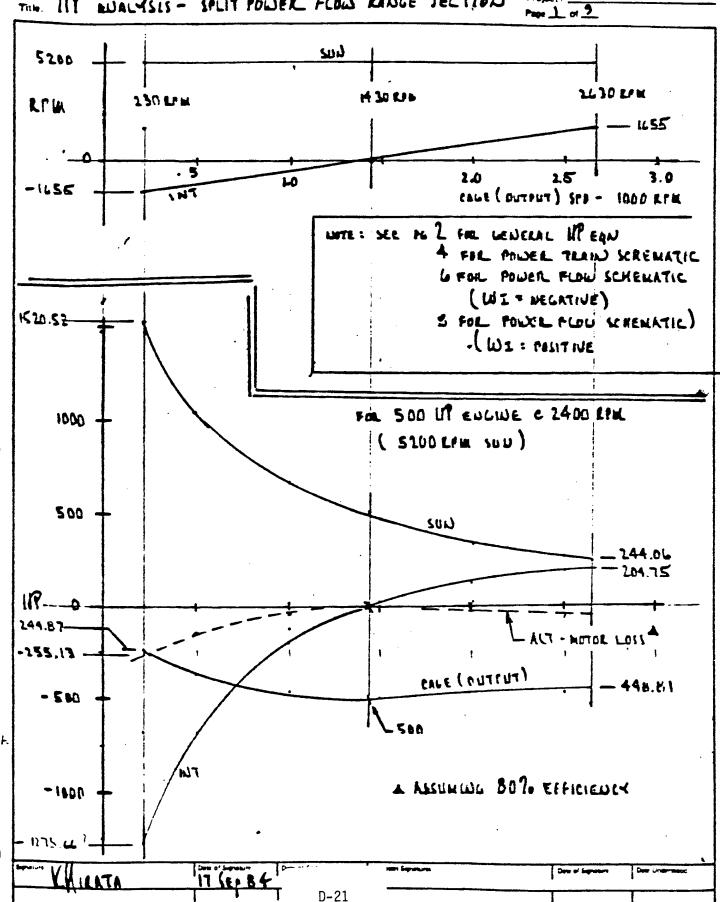
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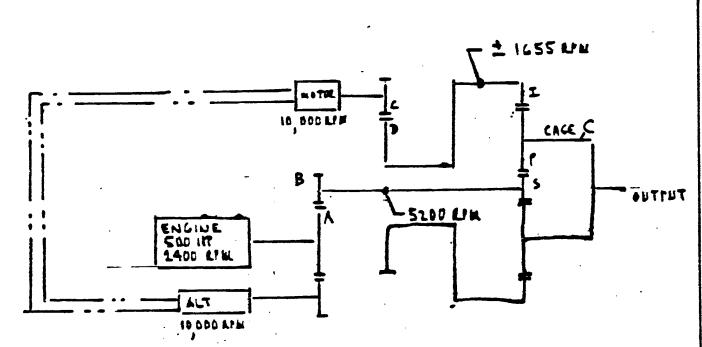
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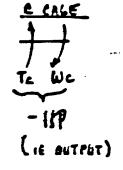
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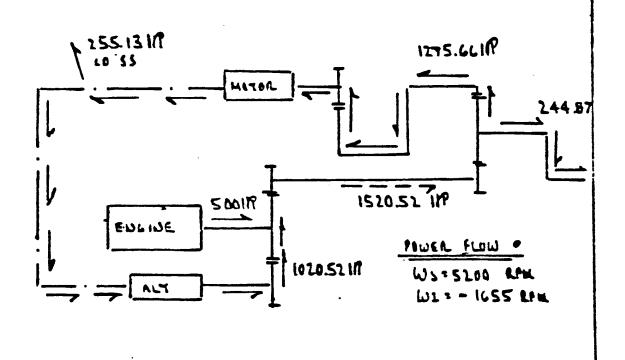
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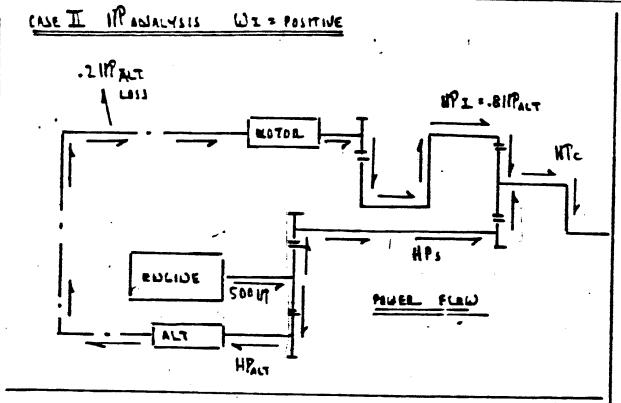
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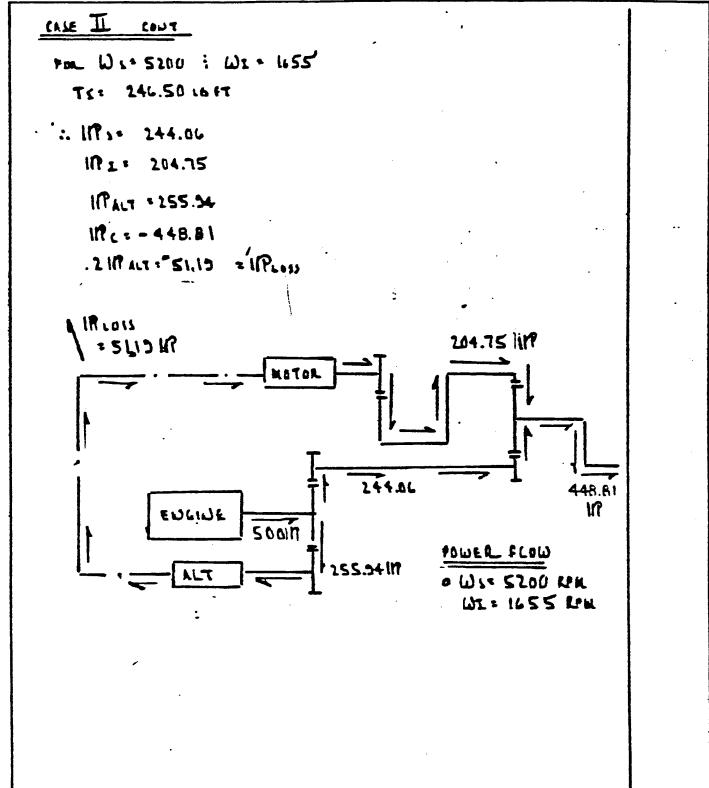
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#### APPENDIX E

ELECTRIC VEHICLE PERFORMANCE SIMULATION

#### E.1 Major Program Capabilities

Electrically driven, tracked vehicle-performance is simulated by this software package. Parameters which may be investigated include detailed electrical system performance, vehicle track dynamics, system losses and efficiency, incremental and average gross vehicle dynamics, and fuel economy. There are four subprograms which have been created to specifically consider each of these areas in detail. A brief description of each is given below.

#### E.1.1 Constituent Subprograms

o Electric Drive Performance - Steady-state vehicle powertrain analysis with detailed emphasis on electric power drive parameters. Electric motor voltages, currents, generated power and alternator/generator output are calculated, along with energy usage, heat rejection, and fuel use impact.

o Vehicle Acceleration Performance - Analysis of dynamic vehicle performance which realistically simulates the gross vehicle mission over the terrain conditions. Acceleration, deceleration, braking, and constant velocity conditions are considered.

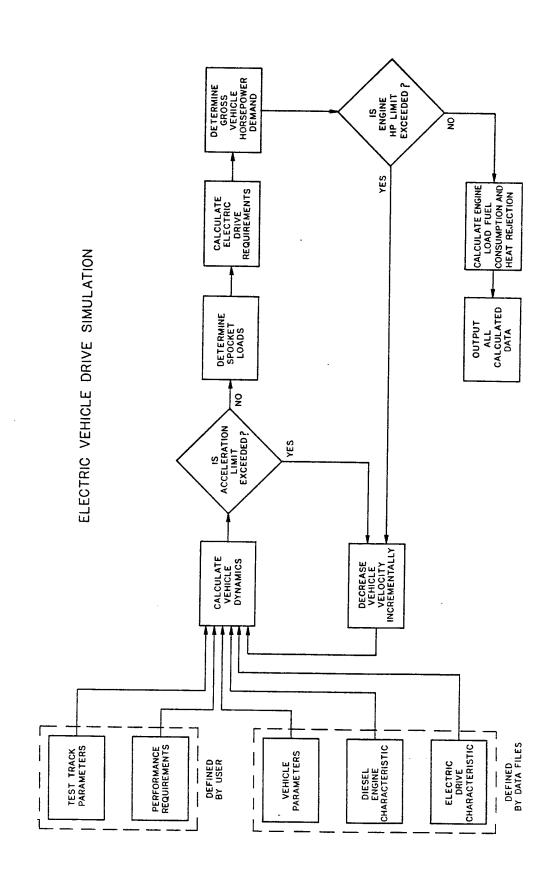
o Acceleration Dynamics Routine - Detailed analysis of full power acceleration during turning and nonturning maneuvers on user defined grades and surfaces. Incremental dynamic parameters are generated and tabulated.

o Reduction Dynamics Routine — Detailed analysis of speed/torque loading of all vehicle power train reduction elements. Final sprocket drives and prime mover interface reductions are included in the analysis.

Of four subprograms provided, the first two are perhaps the most useful for the consideration of the vehicle electric drive and the impact that it has on the overall vehicle mission. The latter two routines are best utilized for detailed investigation of those processes which help to make up the overall mission, but are not the parameters of major interest from a mission viewpoint. For this reason all further discussion will focus on the performance supprograms.

#### €.1.2 Performance Model Description

Each of the performance subprograms outlined above rely on an iterative energy balance technique to yield each steady-state operating point of the vehicle. The basic algorithm for this strategy is shown in Figure E.1.2-1. Test track parameters and



performance requirements are defined and input by the user, along with vehicle, engine, and electric drive data which are resident within the program's data files. The vehicle dynamics are then calculated utilizing a Merritt's track model which considers dynamics based on empirical data. Α centrifugal acceleration calculation is then performed to determine limit is exceeded, acceleration such æs personnel restrictions or vehicle track slip (surface coefficient or If exceeded, the vehicle velocity is reduced and the process iterates until the acceleration falls within the selected The sprocket loads which have been calculated are used to determine what the electrical requirements are for each of the sprocket motors. This data is reflected back through the electrical system, ultimately to the prime mover, where the gross vehicle horsepower demand is calculated. At this point the energy balance is tested. If the fixed maximum output power of the prime mover is adequate for the present demand, the resultant system heat rejection and fuel consumption are calculated. the system demands exceed the capabilities of the engine, vehicle load is reduced by lowering the velocity until an energy balance is achieved. When this has been accomplished, either the calculated data is output to the user, as in the Electric Drive subprogram, or it is further utilized in an acceleration or deceleration routine as in the Vehicle Acceleration Performance subprogram.

### E.2 Program Options Available

The following six basic categories represent the various options which are available to the user from the program data files. Certain of the parameters must be defined by the user, such as the performance limitations which are addressed below.

### E.2.1 Test Courses

There are four resident test courses provided within the software package. Each is broken down into segments of defined length, grade, and turn radius.

- o MERADCOM Test Course This course consists of a well defined track which is located in the Aberdeen Proving Ground, Maryland. Sixteen segments make up the track, which has a total circumference of 2.5 miles.
- o Speed on Slope A track consisting of thirteen segments of arbitrary length (1000 ft) was fabricated to aid in the derivation of the contractually required speed on slope curve. Grades from +60 percent to -60 percent are provided with intermediate grade points selected every 5 percent.
- o Tractive Effort vs. Speed This test track is set up with grade values which yield a relatively uniform distribution of tractive effort values (TE) when plotted against speed.

o Churchville Test Course - This test course is the most rigorous and complex provided in the software package. Highly detailed topographical maps of the Churchville area (part of Aberdeen Proving Grounds) were used extensively in the definition of this track, which is comprised of 88 segments. Steep grades, sharp curves, and short segments serve to make this a very demanding and useful evaluator of vehicle performance. The course, which is 3.33 miles in length, is shown in topographic form in figure E.2.1-1, and in elevation in Figure E.2.1-2.

### E.2.2 Course Surface

To provide greater flexibility in the number of options available to the user, the surface coefficient of friction  $(\mathcal{H})$  is selected apart from the physical dimensions of each course. Those available are given below:

- o Concrete/Asphalt,  $\mathcal{A} = 0.80 \text{ (MERADCOM)}$
- o Compacted Soil,  $\mathcal{M} = 0.70$  (Churchville)
- o Loose Sand, 🚜 = 0.55
- o Rocky Terrain,  $\mathcal{A} = 0.45$
- o User Defined

### E.2.2 Vehicle/Engine

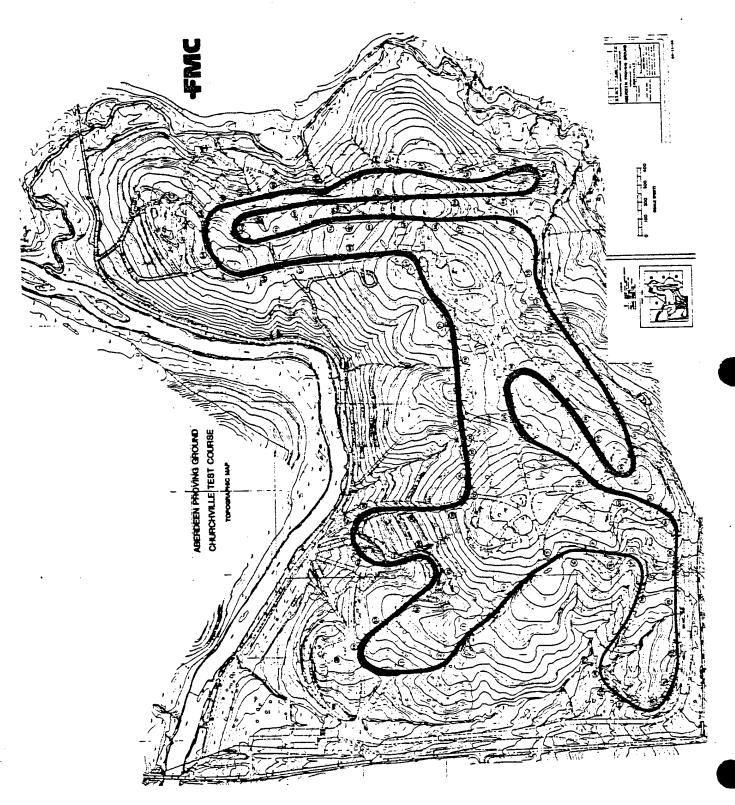
Both the 19.5 and 40.0 ton TACOM specified tracked vehicles are resident within the software package, as well as the specified engines (Cummins VTA-903 for the 19.5 ton, and the AD-1000 for the 40.0 ton). The option is also given to the user to define the parameters of their own tracked vehicle.

### E.2.4 Engine Scheduling

Both constant and variable diesel engine scheduling is available to the user to aid the determination of which is more fuel efficient. Each technique utilizes fuel consumption curves for the VTA-903, and the AD-1000. With constant scheduling, fuel consumption is based on a relationship which is only dependent on demanded HF, whereas with variable scheduling, the demanded HF defines the engine speed which then yields the appropriate fuel consumption.

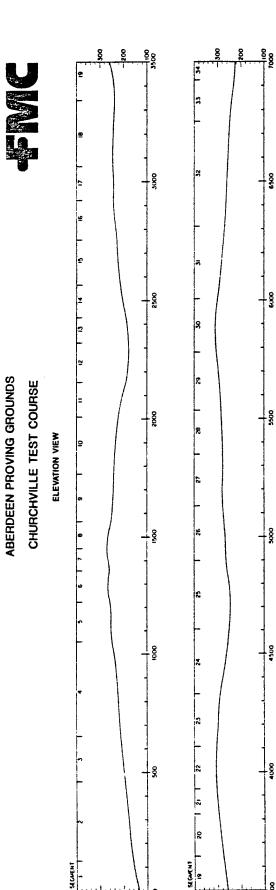
### E.2.5 Electric Drive Type

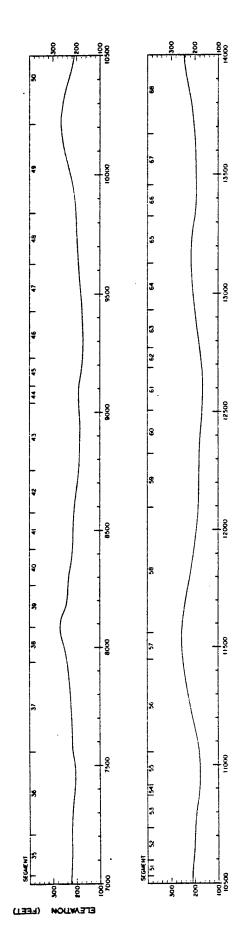
The are eight electric drive types which are resident within the software package. The entire electric propulsion system is

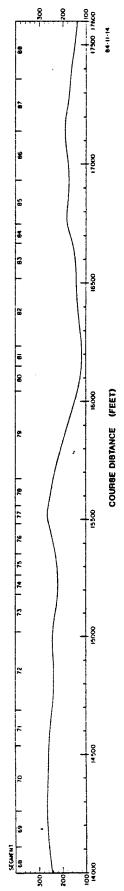


### ABERDEEN PROVING GROUNDS CHURCHVILLE TEST COURSE

SECAMENT







COUNTER-CLOCKWISE TRAVERBAL

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defined for each.

- o Homopolar, Generator Driven (parallel/series systems)
- o Homopolar, Alternator Driven (parallel/series systems)
- o Brushless DC, Alternator Driven (low speed-high torque/high speed-low torque)
- o High Frequency Induction, Alternator Driven
- o Commutated DC, Alternator Driven

### E.2.6 Performance Limitation

Several inputs not available for the internal data files are required of the user. These include:

- o Maximum (final) Forward Velocity
- o Maximum Forward Acceleration
- o Maximum Deceleration
- o Maximum Lateral Acceleration

### E.3 Vehicle Mission Simulation and Analysis

### E.3.1 Electric Drive Performance

The emphasis of this subprogram is the steady state analysis of electrically driven vehicles on a segment by segment basis as the vehicle maneuvers over a given course. It is best suited for analysis of steady state electric drive mission performance. particularly if the course of the mission is relatively uniform, and the segments of each course segment are lengthy in comparison to the time it takes the vehicle to traverse them. sprocket data (see Figure E.4-2) for each track is available to the user, as well as the equivalent sprocket motor dynamics. Motor and system electrical data is also generated, including voltages, currents, and power, including the net power which must be supplied (or absorbed) to both sprocket motors from the bus. These parameters aid in the evaluation of the system operation turns and regenerative conditions, and allow magnitudes and directions of system energy flow to be easily monitored. Net drive efficiency along with generated and lost energy are also provided to determine if overall system performance is within acceptable limits. These energies are reflected in terms of required prime mover power and the resultant fuel consumption. For further mission analysis, fuel economy is calculated, and a range estimate based on a specified vehicle fuel tank volume is made.

### E.3.2 Vehicle Acceleration Performance

For any vehicle mission, this subprogram provides the user with the most realistic assessment of vehicle performance over All vehicle transitory states conditions. acceleration, deceleration, braking) between constant velocity conditions are considered in order to yield smooth vehicle motion The subprogram is specified for overall throughout the course. analysis rather than an electric drive component This is evident in the printed output evaluation. Figure E.4-3) which provides detailed acceleration/deceleration information, but no internal electric drive data. The complete electric drive models are utilized for this analysis but the transitory nature of the vehicle drive during the test periods makes it difficult to extract any meaningful output of the electrical parameters.

As with the Electric Drive Performance subprogram, power supplied by the prime mover is determined along with the system energy which is generated and lost. Fuel consumption data is presented as well as the full fuel tank range estimate. Cumulative mission information is available for each segment of the course, and can provide a useful means of evaluating incremental mission performance.

### E.4 Program Outputs

Examples of the information which each of the subprograms outputs to the user are given in Figures E.4-2 to E.4-5. Figure E.4-1 is the main program header sheet that is included with each run to specify which subprogram is in use and which echoes all the data that has been input by the user.

ELECTRICALLY DRIVEN, TRACKED VEHICLE FERFORMANCE IS SIMULATED BY THIS FROGRAM. DETAILED ASFECTS OF VEHICLE PERFORMANCE BE INVESTIGATED USING THE FOUR RESIDENT SUB-FROGRAM IN USE IS IDENTIFIED WITH AN ASTERISK E P

STEADY STATE VEHICLE	THE BACAMPIE
STEADY S	au aurica
IFMANCE -	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
* 1.) ELECTRIC DRIVE FERFORMANCE	
.) ELECTRIC	1 1 1 1 1 1 1

STEADY STATE VEHICLE FERFORMANCE ANALYSIS WITH DETAILED EMPHASIS ON ELECTRIC FOWER DRIVE PARAMETERS. ENEKGY USAGE, HEAT REJECTION, AND FUEL IMPACT ARE ALSO CALCULATED.

2.) VEHICLE ACCELERATION FERFORMANCE

DYNAMIC VEHICLE PERFORMANCE ANALYSIS WHICH REALISTICALLY SIMULATES GROSS VEHICLE MISSION OVER ALL TERRAIN CONDITIONS. ACCELERATION, DECELERATION, PRAFING AND CONSTANT VELOCITY CONDITIONS ARE CONSIDERED.

t 4.) REDUCTION DYNAMICS ROUTINE

1

ACCELERATION DYNAMICS ROUTINE

DETAILED ANALYSIS OF FULL POWER VEHICLE ACCELERATION DURING TURNING AND NON-TURNING MANEUVERS ON USER SELECTED GRADES AND SURFACES. INCREMENTAL DYNAMIC PARAMETERS ARE GENERATED AND TABULATED. DETAȚLED ANALYSIS OF SPEED/TORDUE LOADING OF ALL VEHICLE FOWER TRAIN REDUCTION ELEMENTS, FINAL SPROCKET DRIVES AND DIESEL ENGINE INTERFACE ARE INCLUDED IN ANALYSIS. MOTOR KM, V/Krpm-Am .005 ELECTRIC DRIVE DATA RECTIFIER EFF, %= 99.5 ALTERNATOR F.F., %= 90 PEAK MOTOR EFF., Xm ALTERNATOR EFF., %= TYPE: HoFol P-A Ghp= 1.5 2100 SPEED FOR MIN. FUEL, rpm= DATE INLET/EXHAUST LOSSES, % AUXILIARY FOWER, hp= 6 COOLING LOSSES, % Ghp= MAX. SPEED, rpm= 2960 MAX. FOWER, hp= ENGINE: VIA-903 ENGINE GROSS VEHICLE WEIGHT, tons\* 19.5 NUMBER OF SPROCKET TEETH= 11 DATE 5 COEFFICIENT OF DRAG\* 1 TREAD WIDTH, In. # 92.5 TRACK PITCH, in. # 6.03 TRACE LENGTH, in. = 150 . VEHICLE FRONTAL AREA, Max. COURSE VELOCITY, mph= 45 COEFFICIENT OF FRICTION" . 7 COURSE DATA PERFORMANCE LIMITS MAN. LAT. ACCEL., g's= SURFACE: COMPACTED SOIL COURSE: CHURCHVILLE

္ 8

FUEL CAFACITY, gal. = 175

100

ton=

ROLLING RESISTANCE, 16. per

MAXINUM VELOCITY, mph= 45

SCHEDULING: VARIABLE

* * *
PERFORMANCE
国とはどの
MINCHELL CO
****

	ELECTRIC DRIVE TYPE HOPOL P-A		RANGE ESTIMATE (miles) 130.85			NET DRIVE EFFICIENCY (%) 67.70		FUEL ECONOMY (mpg) 0.75			Ä	DWER 3
	ENGINE SCHEDULING VARIABLE		AVG. FORWARD VELOCITY (mph) 18.51			TOROUE (+t-1b) 7389,36		FUEL REMAINING (gal.) 174.94		ET MOTOR	HORSEFOWER (hp)	FIELD FOWER (F.H)
	1			* * * *	OCKET	SPEED (rpm) 313.21	•	. L . ) . 62		OUTER SPROCKET MOTOR	10RQUE (#1-1b) 457.07	CURRENT (amps)
* * *	ENGINE	* * *	CUMMULATIVE TIME (sec) 8.99	i	OUTER SPROCKET	HORSEFOWER (hp) 440.67	* * *	FUEL CONSUMED (gal.)	* * *	TUD	SPEED (rpm) 5220.23	VOLTAGE (volts)
FARAMETERS	VEHICLE	Е ВАТА	CUMMULATIVE DISTANCE (ft) 244	MANCE DATA		TORQUE HORS( (4t-1b) (1 -1978.51 44	ВУ ВАТА	FUEL CDNSUMP710N (1b/hr) 194.97	E DATA	Ä	HORSEFOWER (hp) -100.79	FIELD FOWER (Fw)
- 1	MAX, LAT, ACCEL, (g's) 0.50	COURSE	TIME (\$ec) 8,99	PERFORMANCE 	INNER SFROCKET	SPEED (rpm) 275.84 -1	/ ENERGY	ENGINE SPEED (rpm) 2587,32	C DRIVE	INNER SFROCKET MOTOR	TOKQUE HOF (+t-1b)	CURRENT F. (amps)
NDISSIM	MAX. VELOCITY (mph) 45.00	MISSIM	)E RADTUS (4k) (7 100	VEHICLE F	INNER S	HORSEPOWER (hp) -103.91	ENGINE	SEGMENT ENERGY LOBS (btu) 1021.48	ELECTRIC	INNER	SPEED T (rpm) (4597,35	VOLIAGE C (volts) (
* * * *	SURFACE	* * * *	DISTANCE GRADE (41) (%) 244 10.7			ACCELERATION (g's)	* * * *	CUMMULATIVE ENEKUV USED (btu) 3161.99	* * *	TOTOMOSTE	HLIENNAIUN FDWER (KVA) 300.83	FUSS CURRENT (amps)
			SEGMENT NO. (#)		1	FRUNT (K-1bs) 6.15		SEGMENT ENERGY (blu) 3161.99		ON TERMOTERS	SPEED (rpm)	FUSS VOLTAGE (volts)
	COURSE		LAP NO. (#)		di di di di di di di di di di di di di d	VELGCITY (mph) 18.50		HORSEFOWER GENERATED 'hp' 497,46		3	ī <del>-</del>	

	ELECTRIC DRIVE TYPE HOPOI P-0		AVG, MISSION VELOCITY (mph)		* * *	E TIME · (sec.)		FUEL ECONOMY (mpg) 0.98	**********	ELECTRIC DRIVE TYFE		G. MISSION VELOCITY (mph) 31.78		* * *	TIME (sec) 0.00		FUEL ECONOMY (mpq) 1.34
	ENGINE SCHEDUL ING		<b>-</b>		DECELERATION	J DISTANCE (+t)		FUEL REMAINING (9al) 174.89	***	ENGINE SCHEDUL ING		AT PA		DECELERATION .	DISTANCE (41) 6.00		FUEL REMAINING (981) 174,75
* * *	ENGINE 		AVG. VEI	* * *	*** DE(	AVERAGE DECELERATION (g's) 0.00		SEGMENT FUEL CONSUMED (gal)	****	ENGINE VTA-903		AVG.	* * * *	*** DEC	AVERAGE DECELERATION (g's)		SEGMENT FUEL CONSUMED (9al) 0.17
*	VEHICLE 19.5 10N	* * * *	CUMMULATIVE TIME (*ec) 16.93	* PATAG		71ME (sec) 16.80	*	FUEL 1FT 1 DN 1hr)	* *	VEHICLE	* * *	CUMMULATIVE TIME (sec) 37.76	DATA **		TIME (sec) 20.80	* * *	AVG, FUEL SE CONSUMPTION (167hr)
FARAMETERS	MAX. LAT. ACCEL. (g's) 0.50	DATA	CUMMULATIVE DISTANCE (ft) \$87.00	PERFORMANCE D	ACCELERATION ***	DISTANCE (41) 580.72	DATA **	E	FARAMETERS	MAX. LAT ACCEL. (g's) 0.50	DATA	CUMMULATIVE DISTANCE (ft) 1760,00	PERFORMANCE DA	*** NOITON	DISTANCE (ft) 1171.32	*	
	MAX. DECEL. (9's)	COURSE	TIME (SPC) 16.93	"ORM	ACCELE	3E 17 1 ON		RANGE ESTIMAT (miles)	*	MAX. DECEL. (g's) 0.20	COURSE	TIME (sec) 20.83	ORM	ACCEL ERATION	E 110N	DATA	RANGE ESTIMATE (m)les) 235,20
MISSION	MAX, FWD, ACCEL, (q's) 0,50	*	RADIUS TI (4t) (4 0.0		*	AVERAGE ACCLLERATION . (g'#) 0.09	ENERGY	CUMMULATIVE ENERGY USED (btu) 5717.46	************ Δ1001ΩΩΙΣ	MAX, FWD. ACCEL. (g's) 0.50	* COL	K4D1US T1 (ft) (s		* * *	AVERAGE ACCELERATION (q's) 0.02	ENERGY	CUMMULATIVE ENERGY USED (btu) 12572,72
ķ ķ	MAX. VELUCITY (mph) T 45.00	* *	GRADE (%) -0.10	VEHICLE		11ME (sec) 0.13	* * * *	BRAKING ENERGY (btu) 0.00	* * * *	MAX. VELOCITY (mph) 45.00	* * *	GKADE (%) -0.30	VEHICLE		TIME (REC) 0,03	* * * *	BFALING EMERGY (btu) 0.00
	SURFACE  CONCKETE/ASPHAL1		DISTANCE (++) 587.0	* * *	-0C1TY ***	DISTANCE (ft) 6.28		ENERGY REGENERATED (btu) 0.00	* *	SUKFACE  CONCKETE/ASFHALT		DISTANCE (4t) 1173.0	* * * *	OCITY ***	DISTANCE (4t) 1.68		ENERGY REGENERATED (btu)
			SEGMENT NO. (#)		CONSTANT VELOCITY	FORWARD VELUCITY (mph) 33.08		ENERGY E LOSSES REC (btu)				SEGMENT NO. (#) 2		CONSTANT VELOCITY	FURWARD VELUCITY (mph) 42.03		ENERGY E LOSSES REG (btu) (
	COUKSE 		LAP NO. (M)		* * *	LATERAL ACCELEKATION (g's) 0.00		ENERGY GENERATED (btu) 5717.46 2	原学者 海水水 不存在 医牙毛 医克耳氏 医克耳氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克里氏征 医克克氏征 医克克氏征 医克克氏征 医克克氏征 医克克氏征 医克克氏征 医克克氏征 医克克氏征 医克克氏征 医克里氏征 医克里氏征 医克克氏征 医克克氏征 医克克氏征 医克氏征 医克克氏征 医克克氏征 医克氏征 医	COUKSE 		LAF NO. 5		# # #	LATERAL ACCELERATION (q's) 0,00		ENERGY E GENERATED L (btu) (

****	*****		*				***		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	*********	:
		****	* * *	Σ *	**************************************	PAR	PARAMETERS	** 01	# # # # # # # # # # # # # # # # # # #		***
SUKFACE 	GRADE (%) 20.0	RADIUS (ft) 600		INITIAL VELOCITY (mph) 0.10	FINAL VELOCITY (mph) 13.70	MAX. FI ACCEL, (g's)	MAX, FWD. ACCEL. (g's) 0.50	MAX. LAT. ACCEL. (g's) 0.50	VEHICLE	ENGINE  VTA-903	ELECTRIC DRIVE TYPE HOPOI 8-A
			* * *	VEHICLE	CLE		SPROCKET	DATA	* * *		
			1	i			INNER SPROCKET			OUTER SPROCKET	ΕŢ
į		40	TRACTIVE	FORWARD	₽					; ! !	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
>		DISTANCE	EFFORT	ACCEL.		HORSEPOWER	SPEED	TOROUE	HORSEFOWER		TORQUE
(40m) (30s)	÷ 5	(+t)	(K-105)	(a, b)		(년)	(FD)	(ft-1b)	(분)	(rpa)	(ft-1bs)
0.2	M	0.29	26.64	000		74.60		17171	3.83	10.1	00071
	Ō,	0.61	000 PM	0.350		60.21	28,90	10943	94.50	1000	11714
	93	1.05	24.40	0.330		82.35	41.00	10549	87.08	41.88	10921
	Ď.	1.59	23,06	0.300		99.36	52.41	9957	105,29	53, 53	10330
	0.0	2.22	22,16	0.280	~	114.32	62.79	1956	121.31	64.13	6266
	7	2.93	21.26	0.260		126.51	72.47	9168	134.47	74.02	9541
5, 7	ę.	3.73	26.37	0.240		136.09	81.46	87.74	144.90	83.20	9147
	E (	. 6. 	19.47	0.220	-	143.22	89.76	8380	152,78	91.68	8753
	7.0	g	18.57	0.200 0.300		148.05	97.37	7986	158.27	99.45	8328
	Q I	7 04	17.40	C. 185	- •	152.69	104.29	7690	163.52	106.52	8063
_	: :	1	17.07	0.113	•	100.74	130.001	00011 00011	177.12	154.19	1899
	9	77.77	50.0			160.09	130,10	7 00 W	160,24	00.661	ស ( ) ស ( ) ស ( )
	:=	42.14	11.46	0.041	. •	165.47	178.99	485.4	181.04	182.01	0000 M
	9	50.94	11.05	0.032		165,70	186.08	4677	182,73	190.03	2020
12.44	4	59.96	10.74	0.025		165.61	191.61	4000	183,04	195,70	4912
	90	69.16	10.52	0.020		165.68	195.93	4441	183,42	200.12	4814
	Ų:	78.51	10, 34	0.016	-	165.62	199, 39	4363	183.61	203,65	4735
	<b>65</b> (	87.98	10.21	5.0 10.0	-	165.65	202.16	4304	183,85	206.48	4676
	0 9	47.54	10,12	0.011		165.97	204.40	4265	184,33	208,77	4637
	Q. 9	107.18	10.03	600.0		165.97	206.31	4225	184.47	210.72	4548
		06.011	85°4	B :		166.45	207.86	4206	185.07	212.21	4578
		00.07	68.6	90000		165.99	209,25	4166	184.70	213.72	4534
		176.48	, e	000		166.03	210,2B	4147	184.82	214.78	4519
	00	146.52	(i) (i) (i) (ii) (ii) (ii) (ii) (ii) (i	400.0		165.92	211,15	4127	184.77	215.66	4500
	<u>.</u>	000		0.004	-	166.47	211.84	4127	185,38	216.37	4500 0000
		100.11	• · · · · · · · · · · · · · · · · · · ·	0000	•	166.22	212.03	4108	185.17	217.07	4480
		001.00	1,,1	4 C	•	70.00	210.00	4088	184.81	217.60	4461
3.0		0.000, 91	77.0	0.002		100.00	215.74	9804	14.70	218.31	4461
		2.0 -0.0	6.0	1000		27 77	01.4.40	0000	100.17	219.02	1 7 7 7 7
		76. PH	6.0	000	-	166.67	0 / · · · · · · · · · · · · · · · · · ·	0004	14.001	70.40	7 7 7
		265,98	9.67	000.0		166.91	215.47	4068	186.09	27.417	444
			•		•	1 . 00	/F.C.1/	000	100.01		

## GEAR REDUCTION DYNAMICS

	***	在在在 有水水 古祖 在中上 在 中 在 中 中 中 中 中 中 中 中 中 中 中 中 中 中 中	***********	NOISSIW		FARAMETERB	*************************************	*****	****	****
SEG, NO. (#)	COURSE	SE  COURSE	SURFACE	GRADE (%)	RADIUS (+E) 100	FORWARD VELOCITY (mph) 15.80	MAX. LAT. ACCEL. (g's) 0.50	VEHICLE	ENGINE	ELECTRIC DRIVE TYPE HOPOI S-G
			* * * *	GEA	GEARBOX D	DATA *	***			
	no !	OUTER SPROCHET		INNER	IER SPROCKET		10	DIESEL INTERFACE	ACE	
		SPEED (rpm) 4458.4 1486.1 743.1	TOROUE (ft-1b) 443.0 1329.0 2658.0 7383.4	GEAR  GB2-A GB2-B GB2-C GB2-C	SPEED (rpm) 3926.4 1308.8 654.4	TORQUE (ft-1b) -119.1 -357.2 -714.4 -1984.4	GEAR GB1-A GB1-B GB1-C	SPEED (rpm) 2592.0 5184.0 11975.0	(ft-1b) 1009.9 504.9 218.6	
			* * *	MOISSIM		FARAMETERS	* * * *			
SEG. "NO. (#)	COURSE	COURSE CHURCHVILLE COURSE	SURFACE 	GRADE (λ) 11.1	RADIUS (ft) 0	FORWARD VELUCITY (mph) 19.20	MAX. LAT. ACCEL. (g.s) 0.80	VEHICLE	ENGINE	ELECTRIC DRIVE TYFE HOFOI S-G
E-			* * *	GEA	GEARBOX D	DATA *	* * * *			
-14	רחם	OUTER SPROCKET		NZ I	INNER SFROCKET		10	DIESEL INTERFACE	ACE	
	GEAR 	SPEED (rpm) 5094.5 1698.2 849.1	TOROUE (ft-1b) 166.5 499.4 998.8	GEAR GB2-A GB2-B GB2-C GB2-C	SPEED (rpm) 5094.5 1698.2 1698.2	TORQUE (ft-1b) 166.5 499.4 998.8 2774.5	GEAR	SPEED (rpm) 2596,7 5193,4 11996.8	TORQUE (ft-1b) 1010.0 505.0 218.6	
			* * * *	MISSION		PAKAMETERS	* * *			
SEG. NO. (#)	CHURCHVILLE	SE  LE COURSE	SURFACE 	GRADE (%) -7.7	RADIUS (ft) 0	FDRWARD VELGCITY (mph) 45.00	MAX. LAT. ACCEL. (g'⊊) 0.50	VEHICLE	ENGINE	ELECTRIC DRIVE TYPE HOPOI S-G
			* * * *	GEA	GEAREOX D	DATA *	***			
	ומס	OUTER SPROCKET		N	INNER SPRUCKET		10	DIESEL INTERFACE	∌CE	
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### APENDIX F

### CONTRACT VEHICLE AND PROPULSION SYSTEM SPECIFICATIONS

### ATTACHMENT I

### SPECIFICATIONS

### 1. General Vehicle Specifications (Fig. 2):

Frontal Area 6.34 sq m (68.25 ft<sup>2</sup>)

Gross Vehicle Weight 36.3 t (n (40 t on)

Vehicle T op Speed (G overned) 73 Km/hr (45 mph)

Track Length (forward to aft 4650 mm (183.07 in.)

roadwheel centerline)

Distance between track 2790 mm (109.84 in)

longitudinal centerline)

Track Width 580 mm (22.83 in.)

### 2. Propulsion System Specifications:

### a. Transmission: (Electric Drive System)

The drive system shall provide automatic speed ration control and inhibitors to prevent engine overspeed. Maximum output torque required shall be sufficient to generate a tractive effort of \$27,000 Newtons, Reverse - \$27,000 Newtons. There shall be tactile feedback to the driver when the transmission is in forward or reverse operational mode. The power train shall provide for safe, predictable performance for extended periods at speeds below 5 Km/hr.

### b. Steer System:

A regenerative speed control system is required. Differential torque between sides shall be equal to maximum steer torque. Pivot steer capability on hard surface shall be 7 revolutions/min. The steering controls shall remain operative in the event of engine fallure or vehicle towing. The steer system shall be capable of accepting full engine power.

### c. Coding Capability:

Capable of continuous tractive effort operation of at least 250,000 N.

### d. Braking:

The vehicle shall be capable of a deceleration rate from maximum speed on level hard surface road at least 7 m/sec<sup>2</sup> (peak) and 5 m/sec<sup>2</sup> (avg.). The vehicle shall be capable of an included hold with engine off on at least a 60% stope. The vehicle shall be capable of at least 25 stops from 60 Km/hr @ 5 m/sec<sup>2</sup> @ 3 minute intervals. The braking functions shall be accomplished by two separate mechanisms to allow redundance for emergency purposes.

### ATTACHMENT 1 (Cord)

### e. Electric/Hydraulic Power Capability:

Continuous operation of all vehicle electrical and hydraulic systems shall be at least 7 Kw, to include allent watch - the silent watch is non-mobile, with noise, light, and smoke discipline. The above power requirement covers turret hydraulic, racio and other electrical needs, compartment ventilation and NBC countermeasure equipment. Electrical and hydraulic power sources must be capable of operating independently or in parallel in a stable self regulating manner. Average auxiliary power usage is 3.5 Kw.

### 1. Speed on Grade:

The propulsion system shall be capable of sustaining forward vehicles speeds on hard surface roads and grades as defined in Figure 1.

### g. Acceleration

The vehicle shall be capable of acceleration on dry level surface from idle, from application of the throttle, in the forward direction from zero to 32.2 Km/jr (20 mph) in seven seconds; and in reverse direction from zero to 16 Km/hr (10 mph), in five seconds. Assume no "throttle" linkage delay.

h. Engine: See figures 4 and 5.

### i. Shock:

The electric drive system must be able to withstand a 15 g shock load in any direction.

### ATTACHMENT 2

### **SPECIFICATIONS**

### 1. General Vehicle Specifications (Fig. 3):

Frontal Area 5.3 sq m (57 ft<sup>2</sup>)

Gross Vehicle Weight 17.6 ton (19.5 ton)

Vehicle Top Speed (Gloverned) 73 Km/hr (45 mph)

Track Length (florward to aft roadwheel centerline)

Distance between track 2350 mm (92.52 in) longitudinal centerline)

Track Width 445 mm (17.52 in)

### 2. Propulsion System Specifications:

### a. Transmission: (Electric Drive System)

The drive system shall provide automatic speed ration control and inhibitors to prevent engine overspeed. Maximum output torque required shall be sufficient to generate a tractive effort of 208,000 Newtons, Reverse - 208,000 Newtons. There shall be tactile feedback to the driver when the transmission is in forward or reverse operational mode. The power train shall provide for safe, predictable performance for extended periods at speeds below 5 Km/hr.

### b. Steer System:

A regenerative speed control system is required. Differential torque between sides shall be equal to maximum steer torque. Pivot steer capability on hard surface shall be 7 revolutions/min. The steering controls shall remain operative in the event of engine failure or vehicle towing. The steer system shall be capable of accepting full engine power.

### c. Coding Capability:

Capable of continuous tractive effort operation of at least 121,500 N.

### d. Braking:

The vehicle shall be capable of a deceleration rate from maximum speed on level hard surface road at least 7 m/sec<sup>2</sup> (peak) and 5 m/sec<sup>2</sup> (avg.). The vehicle shall be capable of an included hold with engine off on al least a 60% siepe. The vehicle shall be capable of at least 25 stops from 60 Km/hr @ 5 m/sec<sup>2</sup> @ 3 minute intervals. The braking functions shall be accomplished by two separate mechanisms to allow redundance for emergency purposes.

### ATTACHMENT 2 (Contd)

### e. Electric/Hydraulic Power Capability:

Continuous operation of all vehicle electrical and hydraulic systems shall e at least 7 Kw, to include silent watch - the silent watch is non-mobile, with noise, light, and smoke discipline. The above power requirement covers turret hydraulic, radio and other electrical needs, compartment ventilation and NBC countermeasure equipment. Electrical and hydraulic power sources must be capable of operating independently or in parallel in a stable self regulating manner. Average auxiliary power usage is 2.5 Kw.

### 1. Speed on Grade:

The propulsion system shall be capable of sustaining forward vehicles speeds on hard surface roads and grades as defined in Figure 1.

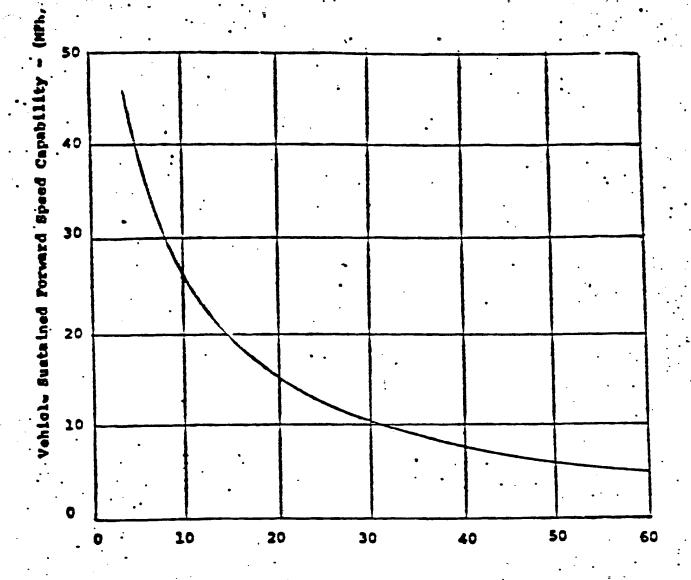
### g. Acceleration

The vehicle shall be capable of acceleration on dry level surface from idle, from application of the throrde, in the forward direction from zero to 32.2 Km/jr (20 mph) in seven seconds; and in reverse direction from zero to 16 Km/hr (10 mph), in five seconds. Assume no "throrde" linkage delay.

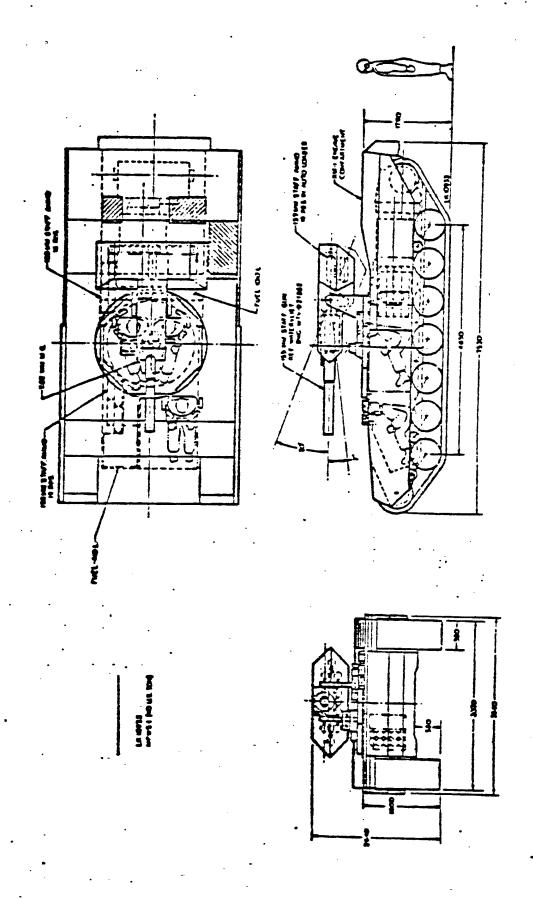
h. Engine: See figures 4 and 5.

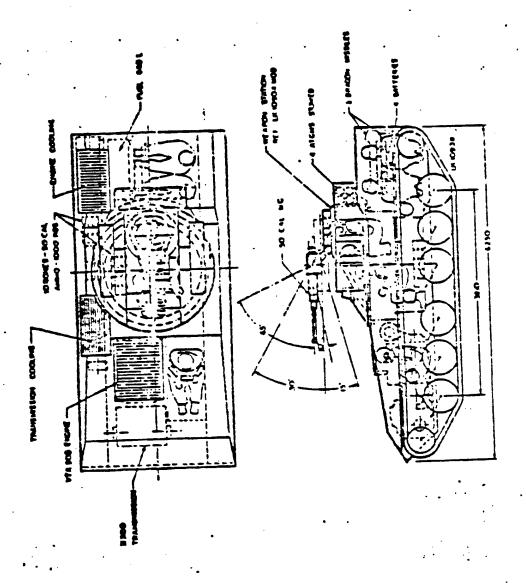
### i. Shock:

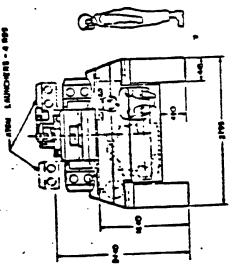
The electric drive system must be able to withstand a 15 g shock load in any direction.

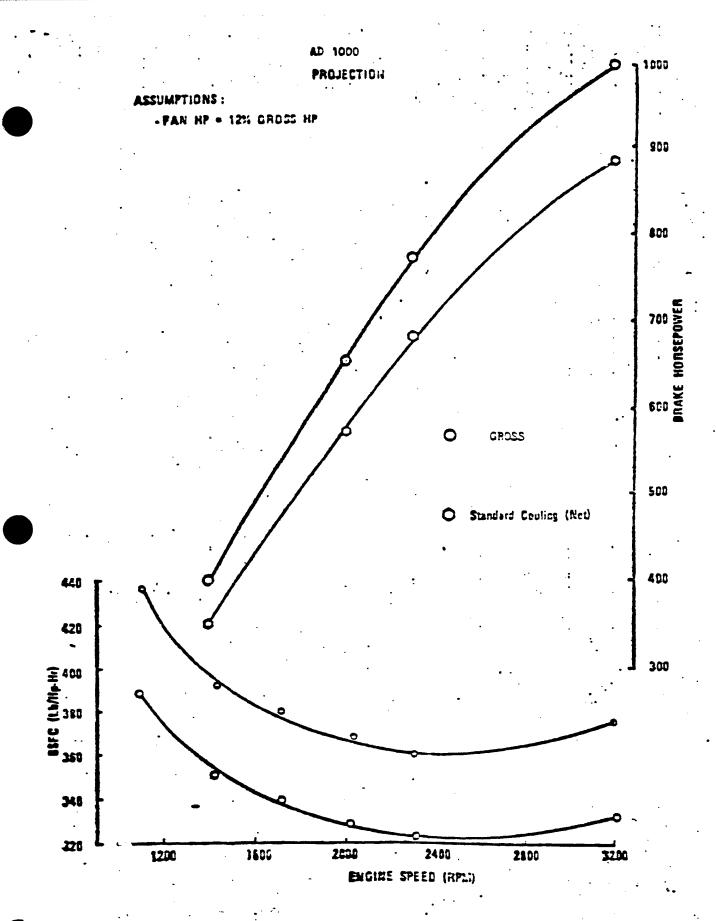


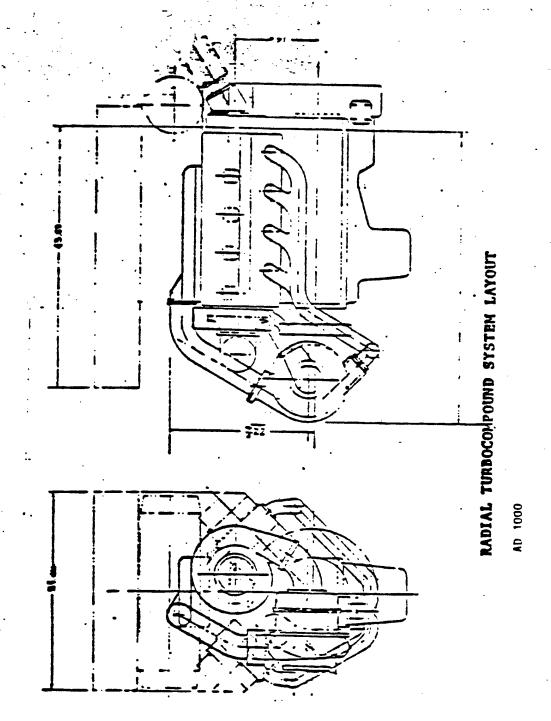
MOTE: Performance shall be measured over hard-surface roads.









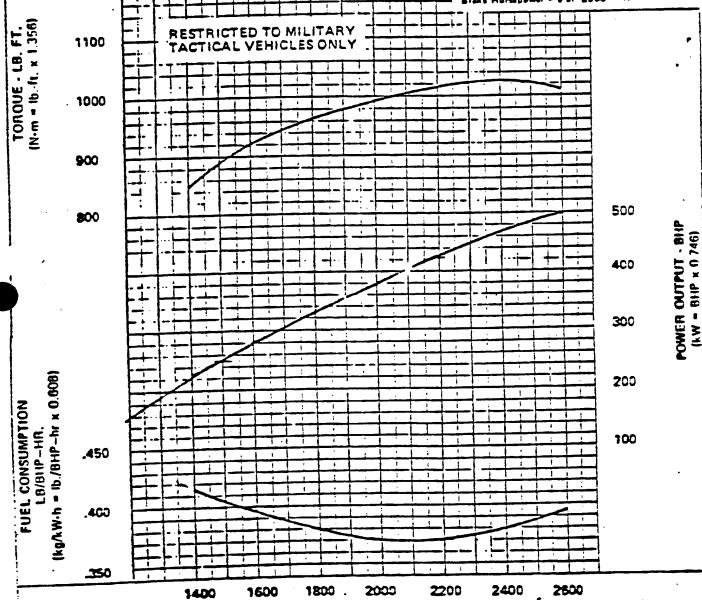


CUMMINS ENGINE COMPANY, INC.

Columbus, Indiana 47201

BASIC ENGINE MODEL: CURVE NUMBER:
VTA-903-T RC-3914-A
ENGINE FAMILY: CPL CODE: DATE: BY:

4/12/79 AUTOMOTIVE PERFORMANCE GURVE 0383 M.L.S. RATIF G: ASPIRATION: TURBOCHARGED & AFTERCOOLED in<sup>3</sup> ( 14.8 fitre) DISPLACEMENT: HE (KW) & RPM STROKE:4.75 in ( 121 mm) NO. OF CYLINDERS: 8 in ( 140 mm) BORE: 5.5 803 (373) @ 2600 FUEL SYSTEM: PT EMISSION CONTROL: AFC im Pull Load Geverned Speed • 2600 RPM: im No Load Geverned Speed • 2960 RPM 1200 Maximum No Load Governed Speed Hersepewer - 0 at 2960 RPM RESTRICTED TO MILITARY 1100 TACTICAL VEHICLES ONLY



ENGINE SPEED — RPM

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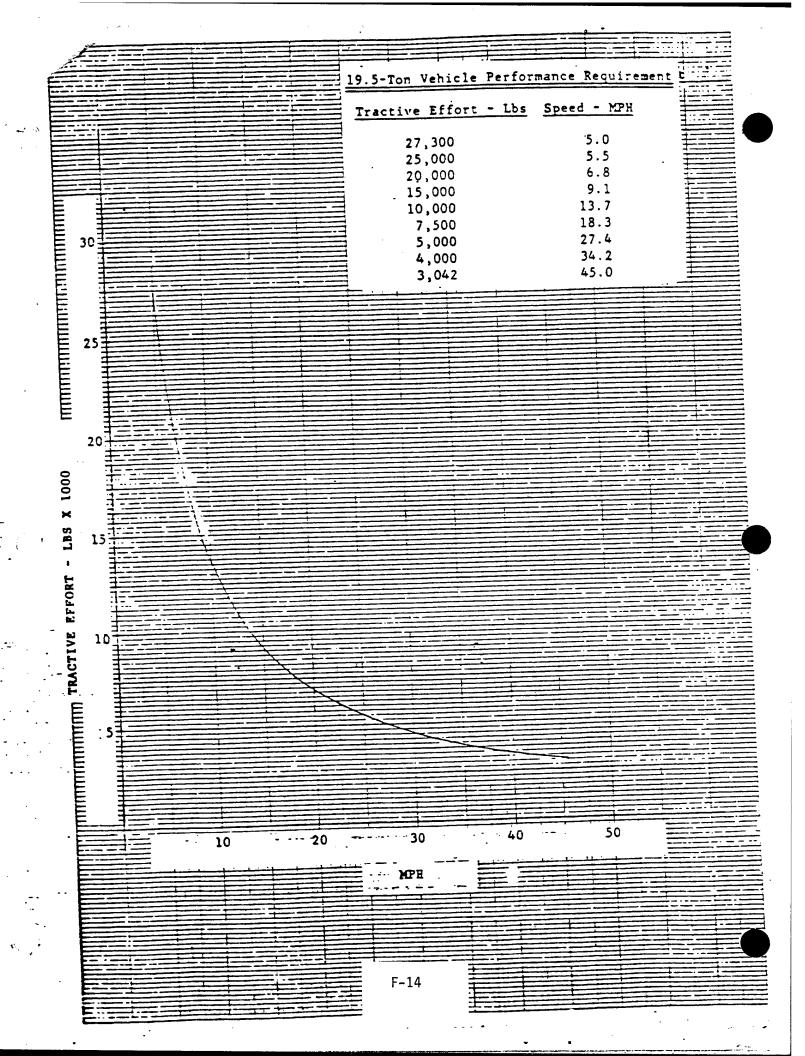
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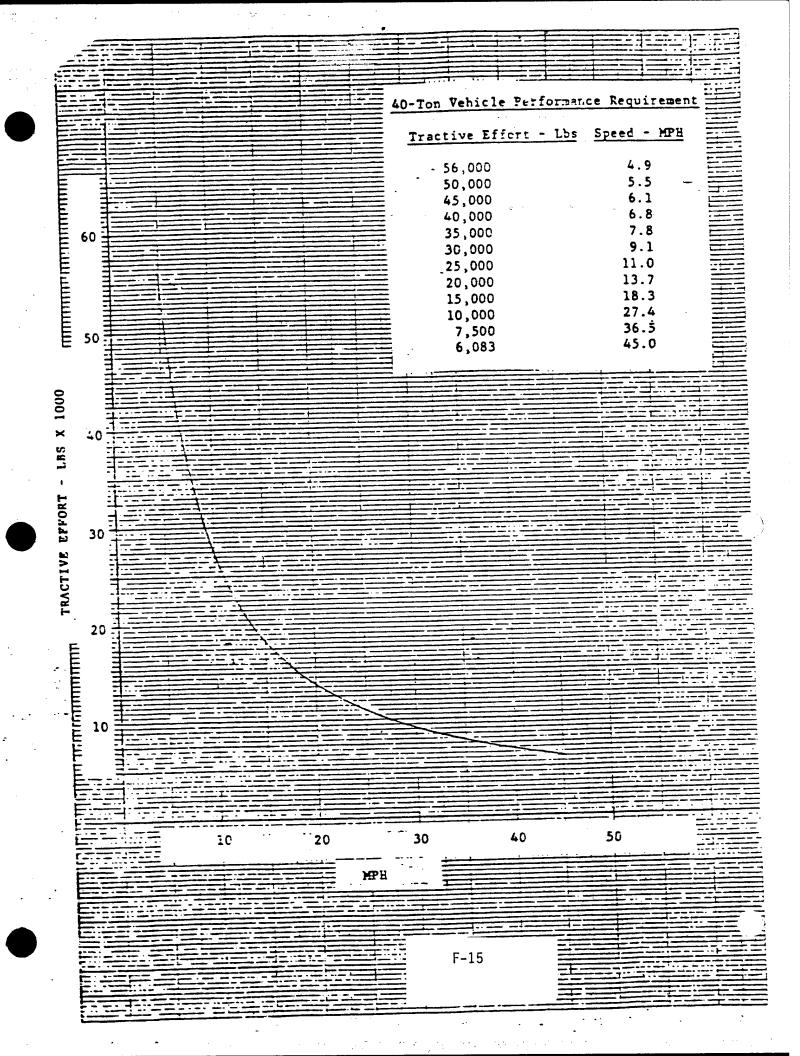
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propelator.





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APENDIX G

HOMOPOLAR MACHINE DESCRIPTION

### APPENDIX 6 Homopolar Machine Description

One of the vehicle drive system concepts selected utilizes homopolar (single pole) machines as the propulsive component. These direct current (DC) machines are characterized by the low voltage ( $\angle$  50V) and high current nature of their output and the simplicity which is inherent in their design.

### G.1 Homopolar Machine Operation

### G.1.1 Voltage Generation

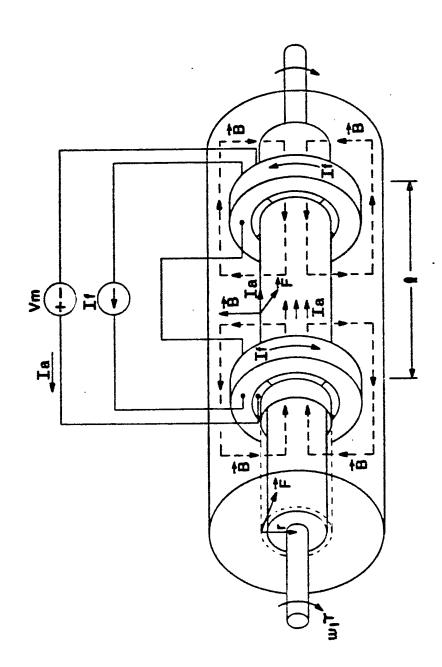
Operation of the homopolar machine is governed by Faraday's Law, which relates the mechanical machine parameters, rotational velocity, and magnetic flux to the voltage produced across the rotor (armature). Specifically,  $V \triangleleft Bwr \triangleleft L$  where;

- V = the voltage generated across the armature
- B = the density of the magnetic flux passing through the rotor
- w =the rotational velocity of the rotor
- r = the radius of the rotor drum
- 1 = the active machine length (defined as the length of the rotor across which the magnetic flux passes)

The manner in which this relation is satisfied by the machine is shown in Figure G.1.1-1. A solid rotor drum, made of iron or other low magnetic reluctance material, is captured within a thin conducting sleeve which is electrically insulated from the rotor. Electrical connections are made around the periphery at each end of the sleeve by a series of sliding brush contacts. coils, which are wound in opposite directions from one another in a circumferential manner, are placed around the rotor near each The entire structure is encased within a housing of magnetic material to provide a low reluctance return path for the magnetic flux. During operation as a generator (the homopolar machine acts equally well in a motoring mode) the field coils are excited with a DC current If, giving rise to a toroidally oriented magnetic flux about each of the coils. The net flux density which passes across the active length of the rotor ( $m{L}$ ) is the combined field from each of the field coils. As the rotor is turned at a rotational speed w, the lines of magnetic flux B are constantly cut by the active length  $oldsymbol{\mathcal{L}}$  , generating a differential voltage across the rotor drum which satisfies Faraday's Law. This voltage is available at the two brush rings, and if connected to a load, will result in the flow of armature current

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# BASIC HOMOPOLAR MACHINE OPERATION



Defining Equations: dデー(Ladf x B) x ナ, [「下トー Laft 臣 I 正]

### G.1.2 Torque Generation

The generation of torque by the homopolar machine is governed by the vector relation  $\mathcal{F} = Ia \ (\mathbf{I} \times \mathbf{B}) \times \mathbf{F}$  and is best understood through consideration of the machine in a motoring mode. With the field coils excited and a potential Vm applied across the armature, an armature current Ia flows proportional to whatever resistance is encountered in the armature circuit. The interaction of the two orthogonal vectors in the directions of the magnetic flux and the armature current give rise to a generated force tangential to the rotor drum. The vector cross product of this force with the radius vector of the machine results in a generated torque about the axis of the rotor. This torque is then transmitted along the shaft.

### G.2 Homopolar Machine Characteristics

### G.2.1 Machine Losses

Homopolar electrical losses are a function of three components; field coil resistance, armature sleeve resistance, and brush contact potential drop and resistance. Of these, the brush losses are the most significant contributor, due to the resistance vs wear tradeoff which must be analyszed when the brush materai is selected. For example, a greater brush force will accelerate brush wear, but will result in a lower resistance and less heating. Lower heat dissipation then helps to lengthen brush life. Active brush cooling helps to reduce some of these factors significantly. Mechanical losses are those normally associated with rotary machinery; i.e., friction and windage. These losses are most prevalent in the machine, and account for the majority of the total losses, particularly if there is little electrical load.

### 6.2.2 Speed/Torque Characteristics

Electrical machines are characterized by the speed vs torque profile which defines the operatng limits at any particular load. A representative curve for a homopolar machine is given in Figure 6.2.2-1. The primary machine limitation is thermal rather than magnetic saturation or reaction torque demagnetization (as with permanent magnet DC motors). As long as adequate heat removal is provided, the homopolar machine can deliver rated torque over the full speed range of the machine. Higher, noncontinuous torques at stall or very low speeds are also attainable and can be maintained with sufficient cooling. Stall torque levels are ultimately limited by brush current density, which coupled with the rotor tip speed, for an envelope which defines the maximum transient load.

### 6.2.3 Homopolar Gain/Control

A primary advantage of homopolar machines is the ability to control their operation through excitation of the field windings

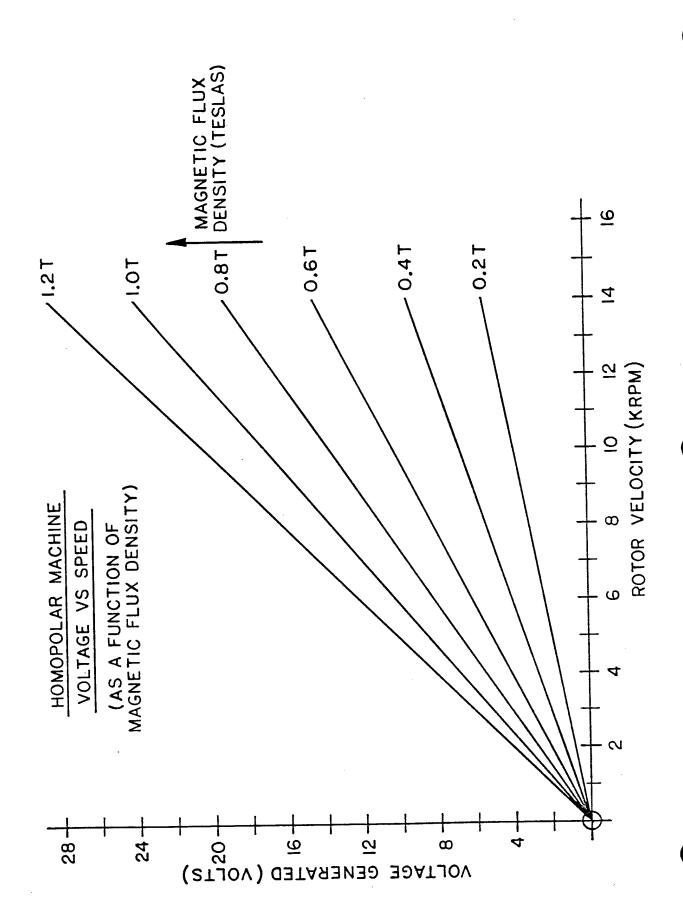
at a much reduced power level. This is in contrast to all AC drive systems which require that a series controller capable of handling the entire motor power be used to generate the necessary AC waveforms. Homopolar machine gain is defined as the ratio of the output power (mechanical for the motoring mode, electrical for the generating mode) to the full excitation power of the field coils. Present homopolar designs yield gains on the order The method of control is best demonstrated by Figure 25 G.2.3-1, which presents a family of linear speed vs voltage Due to the simplicity of construction and single pole nature of the machine, generated armature voltage is a linear function of rotational velocity. The magnitude of the voltage is controlled by the level of magnetic flux in the machine. the flux level is directly proportional to the field current provided, a control parameter for machine speed is realized. In a similar manner, as shown in Figure 6.2.3-2, the armature torque generated is a linear function of the armature current and the Hence torque control is also realized through this level. same control parameter. In a system which incorporates a homopolar motor and a generator, both speed and torque control are available to the user.

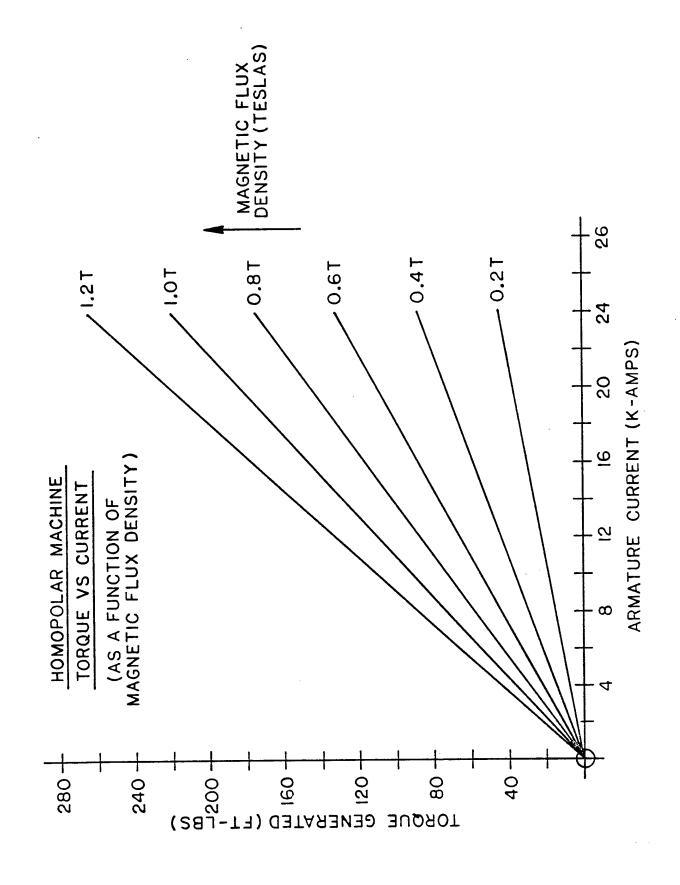
### G.2.4 Power Density

Power densities of homopolar machines are moderate in comparison with those of competing technologies. Although significantly better than those of conventinal DC machines or industrial AC induction motors, homopolar power densities are not as great as those of machines excited by high frequency AC (i.e., high frequency synchronous or hybrid, brushless machines). This is due in part to the low induction level of materials available and thus the amount of magnetic material required to carry the necessary flux levels. It should be realized, however, that if the weight and volume requirements of the series controller required by each of the AC systems is incorporated into an overall system weight for each of the alternate technology macines, a more equitable comparison is achieved. In such a the power density of the homopolar system comparison competitive.

### G.2.5 Thermal Requirements

The homopolar machnes recommended for use as vehicle propulsive elements require liquid cooling for proper operation under normal vehicle loads. This is also true for other high performance technologies (i.e., high frequency AC driven machines). Internal cooling of the homopolar machine rotor drum and brush assemblies are flood cooled, and coolant is circulated through each of the field coils. There is no requirement regarding the ion content of the coolant due to the low potentials which exist within the machine. Precautions, however, should be taken to maintain coolant cleanliness consistent with that required by machines of similar precision.





### G.2.6. Rotor Inertia

Rotor inertia of drum configured homopolar machines are competitive will all alternate technology machines and in many cases, such as with large diameter brushless motors (LSHT), are significantly better. Rotor magnetic material mass is the primary influence on this parameter due to the requirement of a complete flux circuit path. Several innovative inertia reduction techniques have been proposed which could ultimately reduce homopolar inertias to less that 25 percent of present designs, resulting in extremely responsive high power machines with servodrive applications.

APPENDIX H

AC MACHINES OPERATION

### H.1 General

In this section, induction, synchronous, and permanent magnet machines are briefly described in terms of their operation.

H.2 <u>Induction Motors</u>. Induction motors are probably the most universal of all motors in present use. They are characterized by extreme simplicity, very rugged construction, high reliability, and low manufacturing cost. AC induction motors can be designed to operate over wide frequency extremes and are very tolerant to waveshape (although reasonable sine waves are preferable), and applied voltage variations. They can be easily designed for single, two, or three or more phased operations. While single-phased motors are not easily reversible, three-phased designs can be reversed electrically.

Operation of induction motors is best described by transformer theory. For simple example purposes, the stator winding can be considered as the primary winding and the rotor the secondary winding. However, the rotor winding is essentially a number of parallel, shorted turns. Thus, voltage so induced across the airgap causes a voltage and appropriate current to circulate in the rotor windings. This rotor current produces a reactive force which opposes the stator current, producing rotation of the armature which is attached to the output shaft. The motor/transformer analogy, however, is no longer valid when the airgap is considered. In a well-designed multiphase power transformer, the airgap is made as small as possible to minimize the loss in power conversion from the primary to secondary winding. In the induction motor, the airgap must provide a correct balance of induced flux in the rotor and airgap loss. Due to the series relationship of the motor windings and the airgap, and the low resistance of the rotor windings, large currents flow in the rotor conductors when small voltages are present at the rotor windings. This action directly depends on the voltage and current relationships resulting from application of the turns ratio of the stator and rotor windings.

The motor "series" airgap thus balances the excess voltage flux wave not required by the rotor to maintain the rotating speed. In the transformer analogy, this would be equivalent to a high leakage reactance design with a mechanical separation between primary and secondary windings. In this specific case, the leakage reactance balances the excess flux when the secondary winding is shortcircuited.

So far, the discussion has established the theory of rotation for the armature. For the armature to actually rotate, the airgap flux wave must also rotate, either continuously, as in a three-phase AC system, or instantaneously, as in a single-phase AC system. For single-phase systems, a capacitor or separate start-winding is required to shift the phase of the airgap flux wave to start rotation. However, for electric vehicle use, we will consider only the three-phase power system since the three-phase AC system has a naturally occurring flux field rotation.

The transformer analogy of induction motors can also be extended to the relative size of the motor. The well known transformer equation relating flux density, applied voltage, core area, and frequency (a specific application of Faraday's law) applies directly to AC induction motors. Thus, for low frequency AC systems, the area and volume of stator and rotor iron required to support the applied voltage will be greater than for higher frequencies. Coupled with the naturally rotating flux wave of three-phase systems, this sets the physical dimensions of the motor. It also allows for a convenient control of motor speed by varying the applied frequency, since changing the frequency results in a change in the rotating flux field in the airgap. Generally, industrial induction motors can be operated over a minimum of 2/1 speed range with some operation of up to 4/1.

Electric vehicle application experience using AC induction motors has been favorable. Extensive design and testing of induction motor powered vehicles took place in the early 1970's. The test results were generally satisfactory—the major problem being the reliability of the variable frequency inverter. The development effort did, however, establish desirable characteristics for the induction motor (mainly reduced size and weight, and improved efficiency) for electric vehicle use.

H.3 Synchronous Motors. In the discussion dealing with induction motors, it was established that the rotor reactive force is developed by induced voltage and the resultant current is transformed from the stator winding. As the reactive force creates armature rotation, the actual armature positional relationship with respect to the induced rotor flux will be slightly retarded. As the motor approaches full speed, the positional relationship becomes relatively constant, and thus rotates at a speed equal to 3 to 10 percent of the applied frequency base speed. This difference in rotor speed as a ratio of base speed is defined as the slip speed.

A special case can be made for AC induction motor designs in which the slip ratio is held at unity. Under this circumstance the rotor speed and the field flux rotational speed are equal. Motors of this type thus have a synchronous speed relationship, and bear this name. Synchronous motors are characterized by having wound rotors which can be separately excited from an external voltage source, rather than excited through induction from the stator winding. This capability allows for establishing a high reactive force in the armature, even at zero rotor speed. It holds that the stator induced field flux and the rotor reactive force developed from separate power can be individually controlled. Since the rotor reactive force determines the motor torque and the stator frequncy controls the motor speed, the synchronous motor has the inherent characteristics desirable for electric vehicle applications. An additional control characteristic is available in synchronous motors because of slip frequency. Since by definition, synchronous operation requires that the slip frequency be unity, a change in slip frequency requires a corresponding in rotor speed to maintain the motor magnetic circuit in balance. In synchronous motors, the slip ratio can be controlled by a change in the rotor

excitation. Thus for electric vehicle applications, either the stator frequency or rotor excitation may be changed to command acceleration or deceleration, as required.

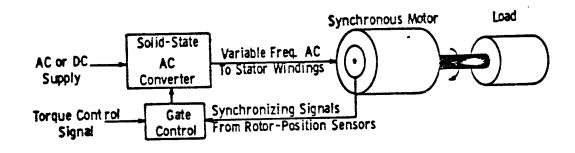
Recent developments in synchronous motors and generators have eliminated the requirement for direct excitation connections to the rotor windings. Figure H.3-1 illustrates the system for controlling the rotor excitation by additional components attached to the common output shaft. The key feature of this system is the integral AC exciter/alternator and rotating rectifiers. This system can produce the required rotor excitation very efficiently due to the transformation action of the alternator. System controlability is excellent due to the high gain available in the control loop. Due to the transformation characteristics of the AC exciter, small, low-power error signals can command the motor/generator system over the full-rated power range. Response times are very short and thus the system is very reactive to operator inputs. This command/control characteristic is desirable in electric vehicle drive systems to maintain both responsiveness and stability.

H.4 Permanent Magnet Brushless DC Motors. During the mid-1950's, development of high energy magnet materials allowed designers to employ these permanent magnets in motor structures as the source of rotor excitation. As permanent magnet materials have improved, designers have applied them to larger motors which at present range up to 50-100 Horsepower. Early development of the permanent magnet motor was characterized by simply substituting the magnet for a wound-field structure in shunt-wound DC motors. The motor thus performed in a similar fashion to the conventional, DC mechanically-commutated motor, except that motor speed increased linearly with applied voltage. This characteristic is due to the fixed, constant-level of field flux generated by the permanent magnets.

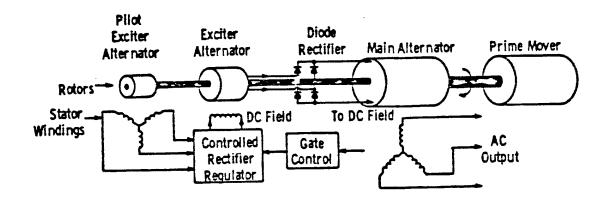
While the speed versus applied voltage linearity was recognized as a desirable characteristic, the speed versus torque curve reacts in an opposite manner. Thus, while speed increases with voltage, torque decreases with speed in a reasonably linear fashion. These features of the permanent magnet motor, while usable in many applications—including small electric vehicle drives, would not be successful in large electric vehicle drives where extreme performance is the requirement.

Within the past ten years, development efforts in permanent magnet motors have produced a true hybrid motor. These hybrid motors have many of the desirable characteristics of DC motors (such as speed versus voltage linearity) while being controlled and commutated from an AC source. This family is generally labeled "Brushless" DC motors.

Brushless DC motors are characterized by their construction which is similar to a conventional multiphase AC motor, except the usual peripheral field permanent magnets are replaced by a multiphase (usually three) winding powered by an electronic inverter. The inverter is operated at selected frequencies which are dependent on motor design and provide the electronic commutation function. The permanent magnets are attached to the rotor in a manner which



(a) High Frequency AC Synchronous Motor Drive



(b) High Frequency AC Synchronous Alternator

Figure H.3-1. Diagrammatic Representation of Brushless Excitation System

provides for field flux in the stator/rotor airgap. This design allows for considerable flexibility in the rotor design and the number of poles available for reacting with the rotor. These design variables result in two basic brushless motor designs: one having small rotor diameters, few poles, and a magnet length dependent upon the horsepower requirement; and one having large rotor diameters many poles and, relatively short magnet length. Generally these two motor types are classified as High Speed/Low Torque (HSLT), and Low Speed/High Torque (LSHT) designs.

Excellent thermal characteristics is one of the major features of the brushless motor design. With the heat-generating windings situated on the stator, low thermal resistance in the stator iron allows for relatively unimpeded heat flow to the outside motor shell. Appropriate cooling can be employed to removed this heat and maintain the motor at rated temperature. Very little heat is generated by the permanent magnet rotor structure and, consequently, the rotor temperature rise is minimized.

General reliability of brushless motors is very favorable. Care must be used in selecting the motor type, however, so that vibration and shock do not cause damage to the magnet structures. Although minor cracking of the magnets will not cause a major motor failure, cracks can cause degradation in motor performance. A more significant failure can result if the magnets fragment and produce chips which can lodge in the airgap.

Brushless DC motors offer desirable features to electric vehicle drives. The control characteristics, when considered with the capabilities of electronic commutation controllers, offer the potential for independent speed and torque control. Motor efficiency is high and the construction provides excellent thermal dissipation. Further, as defined by the vehicle specifications, the brushless motor may be designed for high- or low-speed operation with the appropriate resultant torques.

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